MARCH 10, 1957

electronics

business edition

A McGRAW-HILL PUBLICATION • VOL. 30, NO. 3A • PRICE FIFTY CENTS

NEWS AT A GLANCE

JET-AGE NEEDS BOOST AIR NAVIGATION SALES (page 13) . . . Particle accelerators open new industrial market (15) . . . Schools for prospective customers increase computer sales (17) . . . Management consultants unravel marketing problems (19) . . . Electronic control equipment may help railroaders fatten profits (22) . . . New England spawns research-based industry (39) . . . Aircraft and missile-guidance gear dominates new products (32) . . . Telephone companies get set to use tropospheric scatter (20) . . .

Special Market Report

DIGITAL COMPUTERS . . . (page 24A)

E B POWER GS L 12-
UNIVERSITY MICROFILMS IN
313 N 1 ST
ANN ARBOR MICH * C

ELECTRONIC ENGINEERS

Unlimited opportunities in these interesting areas pay highest salaries to top men

SYSTEMS ENGINEERING
Radar, communications, missile, sonar, countermeasures, airborne electronics

CIRCUIT DESIGN
Advanced military and commercial electronic equipment

PRODUCT DESIGN
Electronic equipment, electron tubes, guided missiles

ELECTRON TUBE ENGINEERING
Microwave tubes, receiving tubes, special tubes—design, development and application

MICROWAVE ENGINEERING
Development of systems, antennas, ferrites, plumbing

TRANSFORMER/MAGNETIC COMPONENT ENGINEERING
Many power and communications applications

OPTICS/INFRA-RED
Advanced development problems

HEAT TRANSFER ENGINEERING
Guided missiles and electronic equipment

SALES/APPLICATIONS ENG.
Commercial and military products

FIELD ENGINEERING
Military electronic equipment

BASIC/APPLIED RESEARCH
Theoretical and experimental in areas related to electronics

ENGINEERING ADMIN.
Procurement, budget control and production

PATENT ENGINEERING
Technical assistance to legal staff

ENGINEERING WRITING
Technical reports, manuals, etc.

to the

1 man in 3

who will qualify as a Raytheon Engineer

You're interested in making the right choice—and so are we. Experience has proved that there's a good job at Raytheon for the intelligent, well-trained engineer. The caliber of our engineering is an indication of the quality of our staff. Here are some facts to help you decide:

Why Raytheon may be right for you

- Young executives, young ideas—many engineer-managers.
- Only electronics company with two prime missile contracts—Sparrow III, Hawk I.
- Individual initiative and originality recognized and encouraged—maximum chance to gain promotions and high professional standing.
- Raytheon radar selected for DEW line and C. A. A. airways traffic control.
- Low turnover—out of 139 professional people in one lab, only two left us last year.
- World's largest producer of magnetron and klystron microwave tubes.

Interesting, advanced work in:

Guided Missiles—air-to-air, ground-to-air. *Radar*—pulse and CW systems, including MTI techniques for search, fire control, bombing and navigation. *Communications*—scatter, radio relay, TV terminal and message circuit multiplex. *Semiconductors* – transistors, diodes. *Microwave tubes*—amplitrons, magnetrons, traveling wave tubes, backward wave oscillators, beam tubes, storage tubes. *Electron tubes*—receiving, subminiature, special purpose.

How to shape-up your future

For the thoughtful, ambitious engineer, horizons can grow wide and bright at Raytheon. You're recognized on ability and achievement. Raytheon men have won national reputations. Others are building them, just as you can.

Salaries are high. Many men take advanced courses at Raytheon's expense at Harvard, M. I. T., etc., leading to a Master's. Then there's wonderfully attractive New England with uncrowded schools and highways—clean air—*good living!*

See us during I.R.E. Show. Members of our engineering staff will be available for interviews at the Raytheon suite in the Convention Headquarters Hotel. Come in or 'phone for an interview.

If you can't see us in New York, please write to Leonard B. Landall. There's no obligation and your inquiry is completely confidential.

Excellence in Electronics

RAYTHEON

RAYTHEON MANUFACTURING COMPANY

Waltham 54, Massachusetts

electronics
business edition

A McGraw-Hill Publication
Vol. 30, No. 3A

MARCH 10, 1957

H. W. MATEER, *Publisher*

W. W. MacDONALD, *Editor*

Managing Editors: Vin Zeluff, John M. Carroll.

John Markus, *Feature Editor.*

Associate Editors: Alexander A. McKenzie, John M. Kinn, Jr., Frank Leary, Michael F. Tomaino, Howard K. Janis, Sylvester P. Carter.

Assistant Editors: William P. O'Brien, William G. Arnold, David A. Findlay, Haig A. Manoogian, George Sideris, Lawrence Kamarck, Edward DeJongh, John F. Mason.

Pacific Coast Editor (Los Angeles) Harold C. Hood; *Midwestern Editor* (Chicago) Harold Harris; *New England Editor* (Boston) Roland J. Charest.

Harry Phillips, *Art Director.* Roy Thompsen, Barbara Ellwood.

John C. Wright, Jr., *Production.* Jean L. Matin.

Editorial Assistants: Gloria J. Filippone, Arlene Schilp, Bernice Duffy, Barbara Hearst, Noreen Hennessy, Phylis A. Cronin, Barbara M. Shaw.

JAMES GIRDWOOD, *Advertising Sales Manager.* R. S. Quint, *Assistant Advertising Sales Manager and Buyers' Guide Manager.* Fred Stewart, *Promotion Manager.* Frank H. Ward, *Business Manager.* George E. Pomeroy, *Classified Manager.* Jean Heiges, *Research.* Wallace B. Blood, *Market Consultant.*

New York: Donald H. Miller, Henry M. Shaw, Martin J. Gallay. *Boston:* Wm. S. Hodgkinson. *Philadelphia:* James T. Hauptli. *Chicago:* Bruce Winner, Walter M. Luce. *Cleveland:* Warren H. Gardner. *San Francisco:* T. H. Carmody, R. C. Alcorn. *Los Angeles:* Carl W. Dysinger. *Atlanta:* R. H. Powell. *Dallas:* Gordon L. Jones. *London:* Herbert Lagler.

Keith Henney, *Consultant.*

Industry Outlook

SINCE PIONEERING days the U.S. has been a nation on the move. That's how it is today. More people going more places faster than ever before. Electronics can add much to the safety and comfort of a traveling public:

- Automatic computers will speed the President's $52-billion highway building project. Twenty states have computers installed or on order. Others will soon follow suit.

- Radio, radar and central control equipment will regulate highway traffic signals, curb speeders, coordinate maintenance and enforcement units.

- Electronic switching is helping railroads make one track do the work of two or even four, shuck off excess right of way and restore a favorable profit picture.

- New jet airliners are using more navigation and communications equipment than older propeller-driven aircraft. Coming more universally: anticollision radar.

- More airway facilities are in the works, with a report of the President's advisory committee due this month. Possible additions: enroute radar, wide-band data links, improved landing aids to bring in more planes faster when weather closes in.

All of this adds up to good business for makers of mobile and point-to-point communications equipment, automatic computers, control gear and radar for at least a decade. Afterwards, a continuing business in installation, maintenance and replacement.

▼

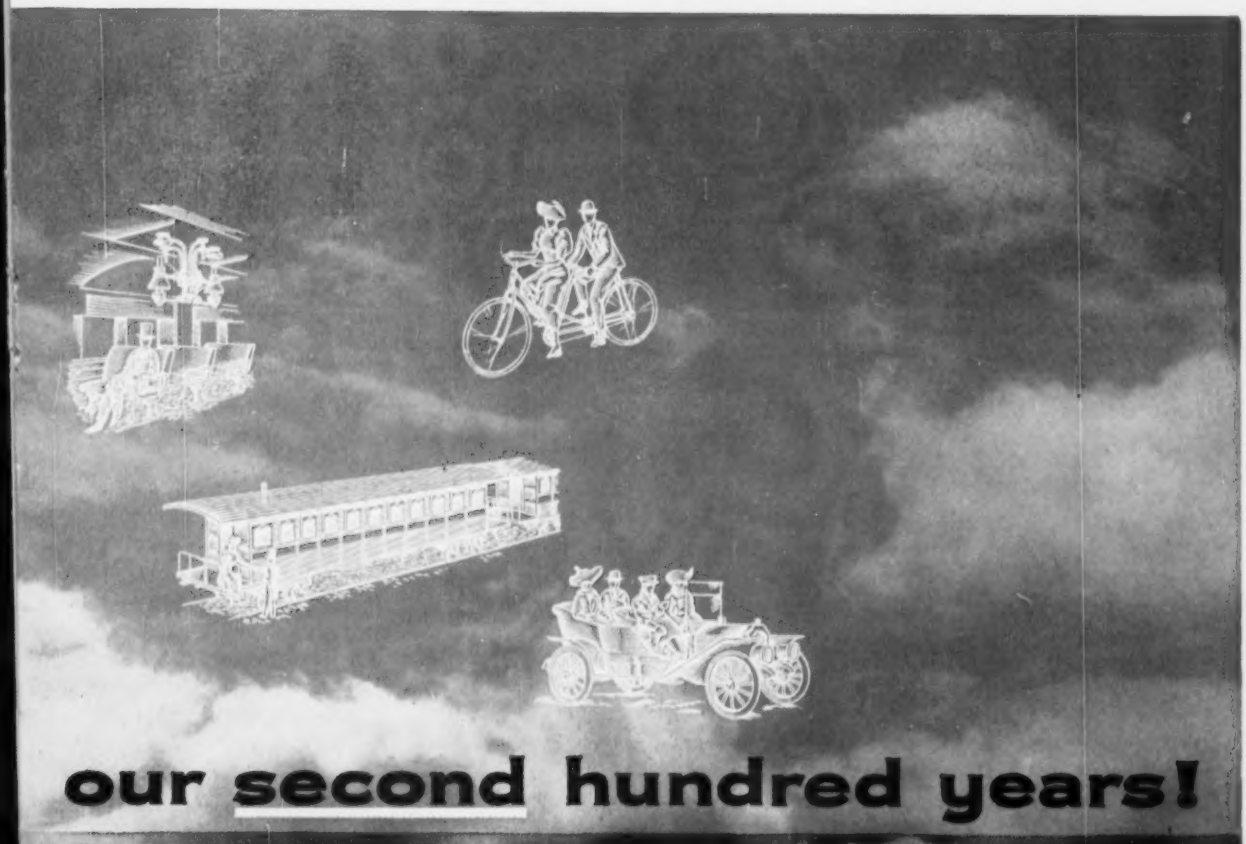
Published three times a month, with an additional issue in June, by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42 St., New York 36, N. Y.** Longacre 4-3000. Publication Office 99-129 North Broadway, Albany 1, N. Y. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Subscriptions: Address correspondence to Electronics—Subscription Service 330 W. 42nd St., New York 36, N. Y. Allow one month for change of address. Subscriptions are solicited only from persons engaged in theory, research, design, production, maintenance and use of electronic and industrial control components, parts and products. Position and company connection must be indicated on subscription orders.

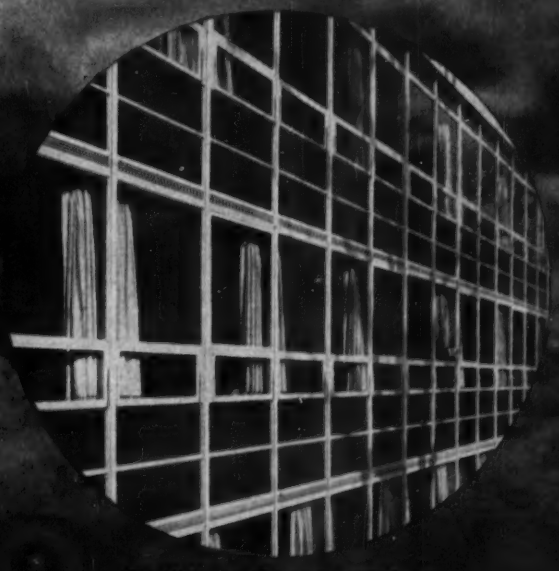
Single copies 75¢ for Technical Edition and 50¢ for Business Edition in United States and possessions, and Canada; $1.50 and $1 for Latin America; $2.00 and $1.50 for all other foreign countries. Buyers' Guide $3.00. Subscription rates—United States and possessions, $6.00 a year; $9.00 for two years. Canada, $10.00 a year; $16.00 for two years. Other western hemisphere countries and the Philippines, $15.00 a year; $25 for two years. All other countries $20.00 a year; $30.00 for two years. Three-year rates accepted on renewals only, are double the one-year rate. Entered as second-class matter August 29, 1936, at the Post Office at Albany, N. Y., under act of Mar. 3, 1879. Printed in U.S.A.

Copyright 1957 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. **BRANCH OFFICES:** 520 North Michigan Avenue, Chicago 11, Ill.; 68 Post Street, San Francisco 4; McGraw-Hill House, London, E. C. 4; National Press Bldg., Washington, D. C. 4; Architects Bldg., 17th & Sansom Sts., Philadelphia 3; 1510 **Hanna Bldg.**, Cleveland 15; 856 Penobscot Bldg., Detroit 26; 3615 Olive St., St. Louis 8; 350 Park Square Bldg., Boston 16; 1321 Rhodes Haverty Bldg., Atlanta 3, Ga.; 1125 West 8Sixth St., Los Angeles 17; 919 Oliver Building, Pittsburgh 22. ELECTRONICS is indexed regularly in the Engineering Index.

1857
1957 . . . and now for
Transportation
Electronics



our second hundred years!



A lot of history has passed in our first hundred years. We have seen sweeping changes take place in every area of human experience. But Adams & Westlake has not changed in policy or in dedication to the maintenance of product quality. Every Adlake product must be as excellent as our 100 years of know how can make it. This assures continuing growth for us and better products for our customers in the transportation, electronics and building construction industries.

Building Construction

The Adams & Westlake Company

NEW YORK ELKHART, INDIANA CHICAGO

SPOT WRITING RATE:

FASTER THAN THE *SPEED* OF *LIGHT*

Developed to meet the precise needs of nuclear research and investigation, the Du Mont Type K1409 cathode-ray tube develops a spot writing rate exceeding the speed of light.

This is another example of the "can do" spirit and ability of the Du Mont Tube Research Laboratory.

For cathode-ray tubes, or multiplier phototubes of unusual abilities, call on Du Mont's "can do" . . .

DU MONT®

INDUSTRIAL TUBE SALES,

ALLEN B. DU MONT LABORATORIES, INC.
2 MAIN AVE., PASSAIC, N. J.

Want more information? Use post card on last page.

FINANCING the big risks

Will loan $200 million in '57
Look to growth for repayment
Take asset pledges for security

COMMERCIAL financing companies are an important source of funds for the electronics industry. Well over $200 million will be advanced by these specialized lenders to manufacturers of electronic equipment, parts and supplies in 1957, believes William J. Drake, secretary of the National Commercial Finance Conference.

More important than volume of loans is interest in lending to small growth firms, often unable to meet bank credit standards. In the electronic industry the well-established firm of today is often the overextended and undercapitalized firm of yesterday. For example, financing companies supplied much of the credit needed by the infant tv-set manufacturing industry in its early days.

Commercial financing companies specialize in making secured loans to commercial borrowers. Accounts receivable, equipment and inventories are the securities they most frequently lend on. However, commercial finance lenders do not purchase receivables nor do they take over the collection function.

Little concerned with conventional liquidity requirements, they often lend to firms with deficit working capital. The finance company looks for an affirmative answer to two questions: Can the borrower profitably utilize the money he wants? And what is the forced liquidation value of the pledged security?

Finance company rates are higher than banks, ranging from 1 to 1½ percent per month. But they require no average balance. Interest is charged for the number of days the money is in use rather than for a fixed term.

SMALL firms active

SMALL and moderate-sized commercial financing companies are currently most active in electronic industry financing.

Coastal Commercial of New York last year advanced about $19 million to electronic firms. Its

SHARES and PRICES

INDUSTRIAL RECORDING instruments are sold to a limited market. Most customers are found among utilities and process industries. A rough estimate of the annual market value is $100 million.

Ten years ago most industrial instruments were meters and pen recorders indicating pressure, temperature, rate of flow and liquid level.

Today, feedback control systems have brought instruments almost to the point of automatic plant operation. Through minor closed loops, these systems analyze a portion of the process and provide approximate control signals that correct the error.

Lower prices of electronics stocks during the past 18 months suggests a buying opportunity for long-term growth, say the sponsors of Electronics and Electrical Equipment Shares of Group Securities. In a memorandum to investment dealers the fund suggests that the best time to buy stocks of growth leaders is when they have not done well.

Energy Fund has recently added 2,000 shares of Texas Instruments common stock to its portfolio.

Servomechanisms, N. Y. producer of subsystems, computers and components recently paid its twentieth consecutive quarterly dividend.

Industrial Instrument Manufacturers	Recent Price	1956 Dividends	Percent Yield	Earned per Share 1956	Earned per Share 1955	Traded	1956 Price Range
Beckman Instruments	38½	stock	——	1.36 (6 mos)	1.06	NYSE	25⅛–43⅛
Leeds & Northrup	27¾	0.80	2.9	3.84 (year) [3]	2.37	OTC	——
Minneapolis-Honeywell	75¾	1.75	2.3	2.30 (9 mos)	2.98	NYSE	58 –90½
Neptune Meter	30	1.75	5.8	2.73 (9 mos)	3.35	ASE	28⅜–36
Panellit	7½ [1]	0.22½	3.0	0.12 (6 mos)	d-0.27	OTC	——
Perkin-Elmer	23½ [1]	——	——	0.59 (year) [3]	1.44	OTC	21 –27¾
Robertshaw-Fulton Controls	26¼	1.50	5.7	2.80 [2] (year)	2.51	NYSE	21½–24¾

[1] bid prices [2] estimated [3] fiscal year d—deficit

clients range in size from two-employee to five-hundred-employee firms. Advances to individual firms range from $10,000 to $100,000.

Inland Credit, another New York outfit, is also close to the electronics industry. Last year 15 percent of its total outstandings, or $15,000,000, went to electronic firms. Its president, Oscar Dane, formerly headed his own radio manufacturing firm, Templetone Radio.

Some factoring firms such as James Talcott and Mill Factors have entered the field on a modest scale; but as makers of commercial financing loans rather than as factors. The electronics industry has not been generally receptive to traditional factoring services which involve the purchase and collection of receivables says one authority.

MONEY lenders comment

"THE QUALITY of management is the main problem in granting loans to small business," says Arthur F. Long, a regional director of the Small Business Administration. "We look to the quality of management as the ultimate security for repayment."

Nelson Loud, new business manager of F. Eberstadt, investment banker, says: "The big problem in deciding to go ahead with a security issue for a small company, particularly growth companies like those in the electronics industry, is the question of management, not only do we look for a good quarterback to head the company, but for sound first and second management teams; and even for young men that are being developed as replacements."

Franklin Elias, president of Coastal Commercial says: "Although the foreclosure value of pledged security determines the amount of the loan we grant, the decision to say yes or no depends on our appraisal of management. If the management is good we may even extend more than the value of the pledge."

Raymond Frankel, Electric Bond & Share executive says: "We have a flexible attitude toward the size of company we invest in. But we feel that the risk is too great for us unless a real management has evolved that has shown itself capable as an operating management." EB&S has recently embarked on a program of investing in electronics and other growth companies.

MERGERS, ACQUISITIONS and FINANCE

Agreement has been reached, subject to stockholder approval, to merge **Statham Laboratories** into **Beckman Instruments,** both of Los Angeles. Statham stockholders will receive about 400,000 shares of Beckman stock, which will equal a 25-percent equity interest in the surviving firm. Statham is a leading manufacturer of precision pressure transducers and accelerometers. The merger is cited as a step toward Beckman's plan to build an integrated instrumentation and automation company.

Plans for the merger of **Production Instrument,** Chicago into **General Controls,** Glendale, Calif. have been given the go-ahead by shareholders. All Production Instrument assets will be purchased for an undisclosed amount of General Controls common. The merged company will become a division of General Controls and production will continue in Chicago. The 42 branch offices of General Controls will aid in marketing the new division's products.

Ling Industries, Dallas has announced the purchase of **Electronic Wire & Cable,** Los Angeles. ELWICO will be a wholly-owned subsidiary of Ling. The purchase price was not disclosed. The purchase brings to six the number of companies affiliated with Ling.

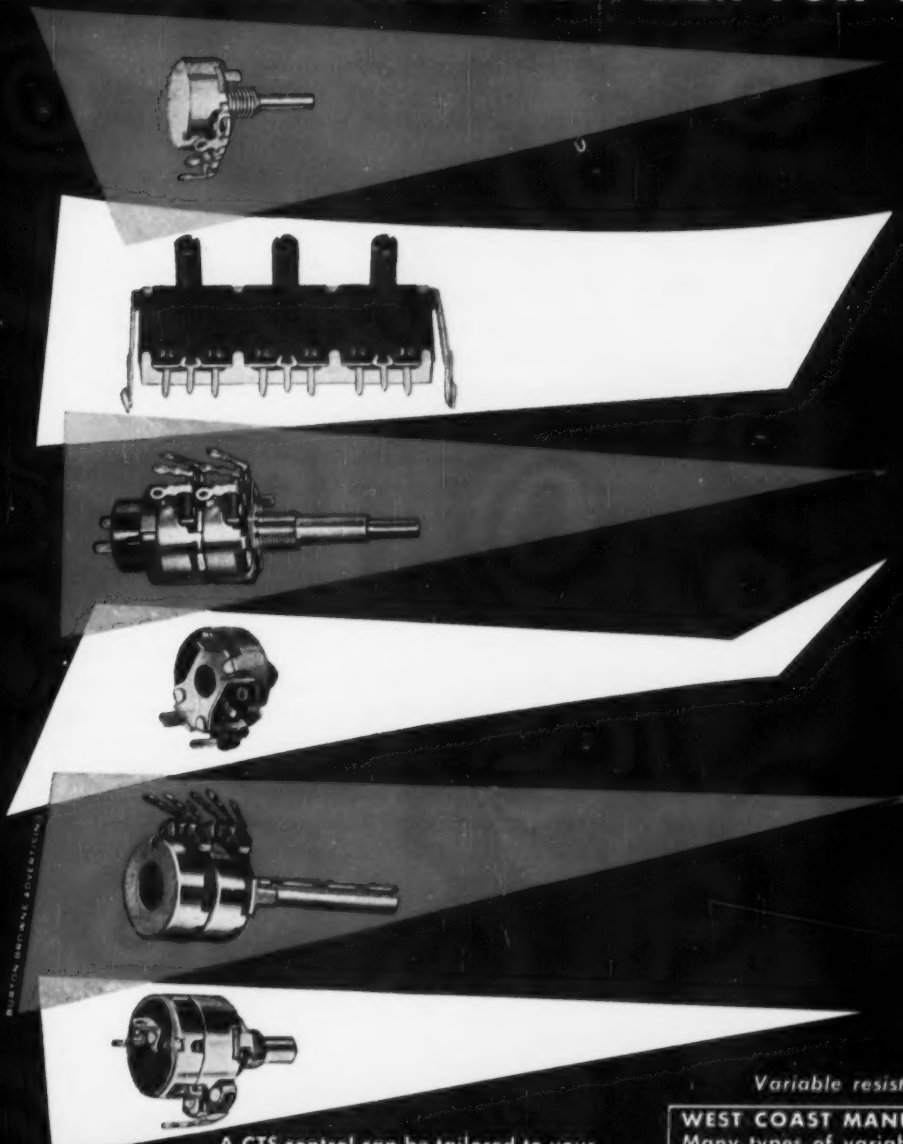
Applied Science of Princeton has privately placed 30,000 shares of $2 par value common stock through Clark, Dodge.

Admiral Credit, a wholly-owned subsidiary of **Admiral,** has been formed to handle the financing of dealer purchases throughout the country. The organization will ultimately finance consumer purchases as well. Establishment of Admiral Credit follows a trend in the industry to expedite and simplify the financing of dealer and consumer purchases.

Two Rockefeller Bros. babies have merger plans. **Airborne Instruments,** Mineola, N. Y. and **Aircraft Radio,** Boonton, N. J. have reached an agreement to merge into a third corporation, subject to stockholder approval. The Rockefeller Bros. have supplied venture capital to both firms. Airborne stock will be exchanged for stock of the new and yet unnamed company on a one-for-one basis.

Holders of Aircraft Radio will be offered one share of the new common for each 1½ shares of Aircraft Radio held. ARC stockholders, as an alternative, can obtain two shares of $10 par, cumulative convertible 5 per cent preferred for each share of common. There are no plans for changes in organizational structure of the companies, which will operate as divisions of the new corporation.

A DEPENDABLE SUPPLIER FOR 61 YEARS



Specialized Technical Skills—1500 job-trained, class-trained specialists . . . with a world-wide reputation for delivering variable resistors exactly as specified.

Tremendous Production Facilities—323,000 sq. ft. plant devoted to variable resistors.

Your changing Requirements Anticipated—continuous research develops new materials, designs and methods to meet your new requirements.

Economical Uniform Assembly—on a precision mass production basis.

Dependable Delivery—exceptionally good delivery cycle.

Complete Line—variable resistors for military, color and black and white TV, radio, and other commercial applications.

Variable resistors shown 2/3 actual size

A CTS control can be tailored to your specific requirement. Consult CTS SPECIALISTS on your current variable resistor problems. Ask for 62 page catalog.

WEST COAST MANUFACTURERS:
Many types of variable resistors now in production at our South Pasadena plant. Your coil, transformer and compression molding business also invited. Prompt delivery. Modern versatile equipment. L. A. phone Clinton 5-7186.

WEST COAST SUBSIDIARY
Chicago Telephone of California, Inc.
105 Pasadena Avenue
South Pasadena, California
L. A. Phone: CLinton 5-7186
TWX LA 1105

CANADIAN SUBSIDIARY
C. C. Meredith & Co., Ltd.
Streetsville, Ontario
Phone: 310

EAST COAST OFFICE
130 N. Broadway
Camden 2, New Jersey
Phone: Woodlawn 6-1668
TWX No. Camden NJ 380
Phila Phone: Market 7-3129

SOUTHWESTERN U.S.A.
John A. Green Company
137 Parkhouse
Dallas 7, Texas
Phone: Riverside 3266

SOUTH AMERICA
Jose Luis Pontet
Buenos Aires, Argentina
Montevideo, Uruguay
Rio de Janeiro, Brazil
Sao Paulo, Brazil

OTHER EXPORT
Sylvan Ginsbury
8 West 40th Street
New York 18, New York
Phone: Pennsylvania 6-8239

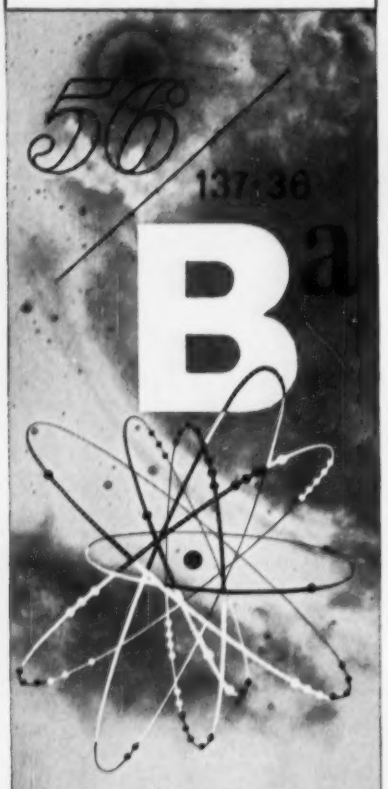
FOUNDED 1896

CHICAGO TELEPHONE SUPPLY
Corporation

ELKHART INDIANA

The Exclusive Specialists in Precision Mass Production of Variable Resistors

ACCEPTED SYMBOLS



Symbol for Barium . . . the element whose oxide, in combination with oxides of calcium and strontium, is used as the emissive cathode coating in *all* electron tubes.

Just as Ba is the accepted symbol for Barium, so Tung-Sol represents the highest quality production of electron tubes to volume requirements. This ability is a major reason why Tung-Sol is America's largest independent electron tube manufacturer.

TUNG-SOL®
ELECTRON TUBES
SEMICONDUCTORS

Tung-Sol Electric Inc., Newark 4, N. J.
Manufacturers of Automotive and Electronic Components.

Want more information? Use post card on last page.

WASHINGTON report

An increasing flow of foreign electronic equipment and parts into the U.S. is being watched by domestic electronics manufacturers.

Electronics imports have shown sharp percentage increases over the past few years—mostly from England, West Germany, Netherlands and Japan.

Checking the exact volume of particular items is difficult, since government statistics are incomplete and lacking in breakdowns for particular components.

- **Enough is known to detect a sharp trend upward. For example, the grouping Radio Apparatus and Parts shows the following for the first 11 months of 1956 (compared with the full year of 1955): United Kingdom $935,000 ($392,000); Netherlands $679,000 ($585,000); West Germany $2,802,000 ($1,632,000); Japan $2,094,000 ($232,000).**

- **Totals from these four countries show an increase, 11 months of 1956 over 12 months of 1955, of about 130 percent from $2,841,000 to $6,510,000. Imports from all countries, in this customs category, were $8,481,000 in 1956.**

- **Japan's increase has been outstanding: Its exports to the U.S. totaled only $34,000 in January of last year; by October they were $330,000.**

Dollar volume of electronics imports is relatively small, compared with the size of the U.S. domestic production, hence the big percentage increases haven't stirred anything resembling alarm. There have been a few complaints, mainly about radios from Germany and Japan, but nothing formal is yet in the works or expected.

Basic fact of the import situation is the comparison with U.S. exports of radio apparatus and parts: in 1956, they came to an estimated $330 million.

MISSILES picked for UK

First missiles likely to go to Britain under recent Wilson-Sandys agreement will be such air-defense missiles as the Nike or Talos, air-to-air missiles like Falcon or Sidewinder. For some time, Britain has been getting some tactical missiles like Honest John. She'll be getting more of these, plus advanced types like Redstone. Delivery of strategic long-range missiles is way in the future.

B-52 jet-bomber production is now scheduled to continue into 1959—but a decision may be made to hold peak output at 17 a month, instead of the goal of 20. Purpose would be to stretch out production another year or more. This would help bridge the time until a ballistic missile will be ready for production. Massive engineering problems are dimming hopes that a nuclear-powered bomber may take over the B-52 role before the ICBM is finally ready.

Post Office Department is after an additional $1 million to expand its development of electronic mail-handling equipment. About half a dozen contracts are already in the works. National Bureau of Standards is working closely with the Department on the program. All told, some 67 government engineers are working on ideas. Three pieces of equipment are being tested.

ACCURACY!

CLIFTON PRECISION SIZE 8 SYNCHROS

LOOK TO CPPC FOR SYNCHRO PROGRESS

CLIFTON PRECISION PRODUCTS CO. INC.

cppc

Clifton Heights, Pa.

VISIT OUR HOSPITALITY SUITE

I.R.E. Convention, March 18-21
Studio K, Barbizon-Plaza Hotel
106 Central Park So., New York City
Noon 'til 10 p.m.

Langevin

8 Watt Audio Amplifiers

Featuring 4 Interchangeable Input Panels

Designed for high quality sound systems, Langevin Type 138 Series low noise, low distortion Amplifiers feature self-contained power supply and plug-in type connectors. Taps on the output transformer for the entire 138 Series permit matching at 3.2, 6.4, 16, and 600 ohms. Small and compact, the 138 Series Amplifiers measure only 3⅛" wide 5" high, and 13" long in a 16 gauge cold rolled steel chassis.

MAXSON MAKES IT

Specifications

Harmonic Distortion: All Models <2.0% 30-15 KC across 6.4 ohm tap at +39 dbm
138-G (includes a preamplifier input for microphones)
Source Impedance: 30, 150, 250, 600 ohms
Gain: 96 db 600 ohms input — 600 ohms output at 1 KC
Output Noise: —63 dbm below full output
Response: ±1.5 db 30 to 15,000 cps
138-K (includes a preamplifier equalized for G.E. or Pickering type pick-ups)
Source Impedance: 6800 ohms
Gain: 75.3 db bridging 600 ohms at 1 KC
Output Noise: —52 dbm below full output
138-L (includes a preamplifier input for high impedance microphones or crystal pickup)
Source Impedance: 1 megohm
Gain: 77 db bridge 600 ohms at 1 VC
Output Noise: —63 dbm below full output
Response: ±1.5 db 30 to 15,000 cps
138-M (includes an input panel designed for bridging or cueing)
Source Impedance: 150, 600, 5,000, 20,000 ohms
Gain: 58 db 600 ohm input — 600 ohm output at 1 KC
Output Noise: —76 dbm below full output
Response: ±1.0 db 30 to 15,000 cps

Complete specifications for 138 Series available upon request. Write: Audio Dept. 2.

MAXSON INSTRUMENTS

47-37 Austell Place
Long Island City 1, New York

Division of the W. L. Maxson Corporation

Want more information? Use post card on last page.

EXECUTIVES in the news

ADMINISTRATOR Pinkerton and friends: A. Haase-Dubosc of CSF and Harry Skifter of AIL

NEW PRESIDENT of equally new International Electronics Corp. is Harry Pinkerton, gregarious Iowa-born engineer-turned-manager. He comes to the job from Long Island manufacturer Airborne Instruments Lab, 40-percent owner of Intec.

Intec is a strange bird in the aviary of joint ventures. It was formed with the stated intent of picking the brains of French electronics complex CSF (Compagnie General de Telegraphie Sans Fil). The French firm is also a 40-percent owner of Intec. Pinkerton, who speaks no French ("of course, I'll learn it") was chosen to head Intec because of his diverse background.

From a start in chemical engineering, he entered electronics via the technical literature route. He formed a company in 1946, bid on the government's mammoth job of translating 220 tons of captured German documents. From evaluating these papers, he learned a lot of electronics, finally went with AIL as an engineer "specializing in administration."

Pinkerton's life is "fully occupied with the problems of job and family." He lives in Oyster Bay on Long Island Sound, likes sailing—"Comet for safety, Star for speed." His sons (two of them, 7 and 11) also keep him hopping.

Right now he's trying to set up a Manhattan headquarters for Intec. "Europeans are lost on Long Island," he says. "Everybody forgets to change trains at Jamaica."

Strictly PERSONAL

Dear Sir:

In the January 20 issue (p 46) . . . you noted that Henry F. Argento has been named vice president and general manager of Philco's Government and Industrial division . . . (with) responsibility for . . . Lansdale Tube Co. and Sierra Electronics.

William J. Peltz is presently vice president and general manager of the Lansdale Tube Co. He will

continue to be in charge of that segment of Philco's business. Mr. Argento's responsibility does include Sierra.

William Wight
Philco Corp.
Philadelphia

Editor:

In regard to your article . . . concerning the Ships Inertial Navigation System (Jan. 20, p 22), one significant fact was omitted. Investigations and research were carried out for the Navy by Charles Draper of MIT's Instrumentation Laboratory.

As a former employee of the Instrumentation Laboratory, I was disappointed when I noticed that the work done by their organization had been overlooked in your article.

Nancy Reid
Sanders Associates
Nashua, New Hampshire

Dear Sir:

Congratulations on your crisp, informative and smart . . . *Business Edition*. This kind of concise, complete and nontechnical reporting . . . will be a lifesaver to nontechnical management, of which I am a member.

I quickly pass on your technical edition to our engineering staff. I shall hide the business edition in my briefcase.

Daniel Aaron
Jerrold Electronics
Philadelphia

Gentlemen:

I would like to offer . . . a word which is finding increasing use in the rapidly growing field of automation. The word is *cybernation* (or *cybernation*). This word, formed by a combination of CYBERnetics and autoMATION, refers to automatic process control by systems involving humans and computing machines.

Richard D. Gloor
Ramo-Wooldridge Corp.
Los Angeles

TWO
VIRGINIA
FIRSTS

both important to your new plant!

America mined its first coal in Virginia as early as 1709. First commercial production was in Chesterfield County in 1750. Eighty-one years later, these pioneer mines created Virginia's first railroad . . . a horse-drawn, thirteen-mile line with cars holding fifty-six bushels each.

Today, Virginia's high-grade coal means many things to your plant. Rolling down at short-haul savings from the nearby mountains, coal gives you cheap fuel . . . a versatile raw material . . . and a source of abundant, low-cost electric power.

And today's rail network gives you the full advantage of Virginia's central location. You're close to the great Northeastern markets. You're at the transportation focus of the fast-growing South. You enjoy favorable rates to the Mid-West. And direct ship-rail connections put world markets and sources of supply within economical reach.

For confidential site-finding help in this land of mild, high-production climate—conservative manpower—friendly, thrifty government—and pleasant living—write, wire or telephone . . .

DIVISION OF PLANNING AND ECONOMIC DEVELOPMENT
Virginia Department of Conservation and Development
State Finance Bldg., Richmond, Va. • Telephone 3-3449

Want more information? Use post card on last page.

NEW GRID-CONTROLLED KLYSTRON NOW IN QUANTITY PRODUCTION

SAL-89

HIGH-POWER PULSE AMPLIFIER FOR AIR NAVIGATION SYSTEMS

In introducing the SAL-89, Sperry is offering the first production tube featuring grid-controlled pulse operation for ease of modulation. This tube, with its unique technological advances, was designed specifically for air navigation and traffic control service.

With grid control, Sperry has greatly eased the problem of modulating high-power klystrons. For example, only 575-volt pulses are now required to modulate the tube where previously 10,000-volt pulses were necessary. Specially shaped pulses are also easily applied to the tube.

SAL-89 incorporates space-charge focusing, another Sperry development, which eliminates large, heavy magnetic structures and simplifies cooling. Integral resonant cavities make external microwave circuits with their associated sliding contacts unnecessary.

For further information on this new tube, write our Electronic Tube Division.

GENERAL CHARACTERISTICS

Frequency Range	960 to 1215 mc
Peak Output Power	30 kw
Grid Bias (Negative)	1% of Beam Voltage
Grid Drive (Positive)	2.2% of Beam Voltage

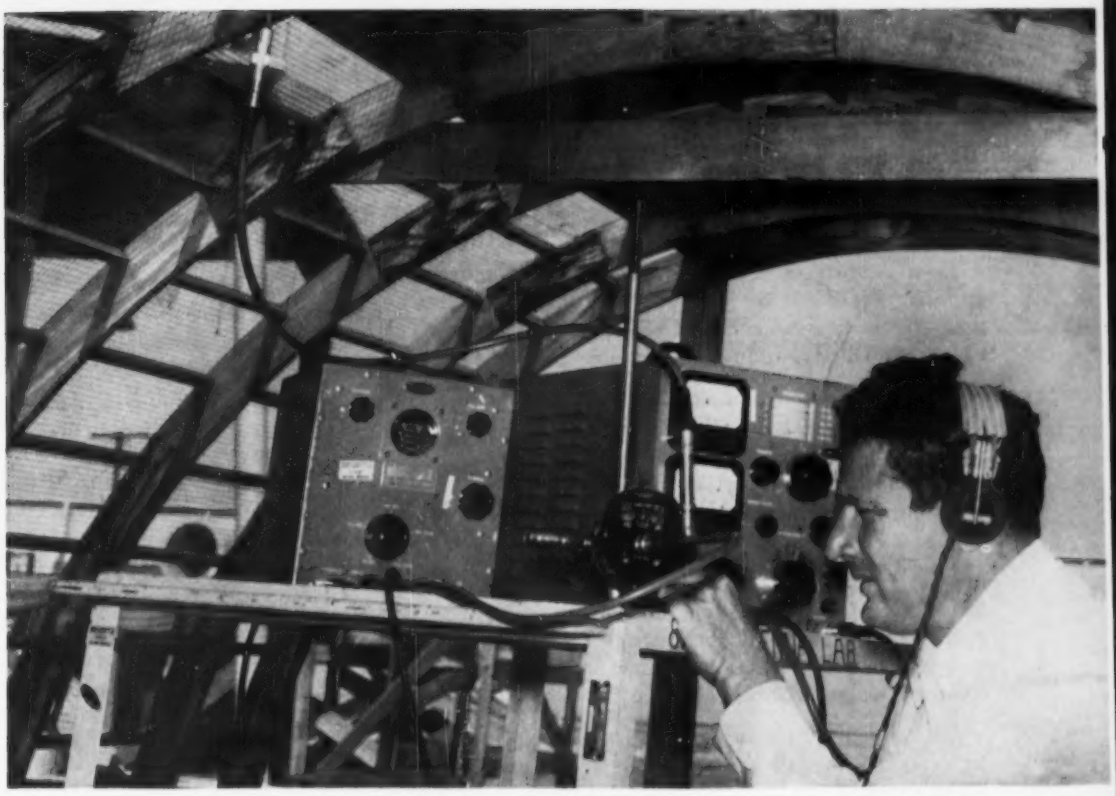
TYPICAL PULSE OPERATION

Frequency	1100 mc
Grid Bias	−170 v
Grid Drive	575 v
R-f Input Peak Power	30 w
R-f Output Peak Power	25 kw
Duty Cycle	2.5%
Beam Voltage	17 kv

SPERRY **ELECTRONIC TUBE DIVISION**
GYROSCOPE COMPANY
Great Neck, New York
DIVISION OF SPERRY RAND CORPORATION

CLEVELAND • NEW ORLEANS • BROOKLYN
LOS ANGELES • SAN FRANCISCO • SEATTLE
IN CANADA: SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC

electronics
business edition
MARCH 10, 1957



MEASURING flush-mounted antenna impedance on a mock-up section of DC-8

Jet AIRLINERS boost sales

Airlines order 397 planes to fly faster, higher with bigger payloads
Sizable piece of $2.6-billion business is electronic
New equipment is designed for navigation, communications, control

AIRBORNE ELECTRONICS spending, outside of the military, is getting a big boost as the nation's air carriers prepare for the jet age. As of the first of the year, 397 planes have been ordered by U.S.- Flag commercial airlines from jet-airliner manufacturers.

Most electronic equipment in jet airliners will contain major design changes. Increased speed is the reason. Some planes ordered are turbojets like the Douglas DC-8, Boeing 707 and Convair 880. Remainder will be the so-called propjets: Lockheed Electra, Fairchild Friendship and the like.

Out of the more than $2.6 billion being spent for the aircraft, a sizable chunk goes for electronics. One

overwater version of the DC-8 will carry gear worth $150,000.

Increased speeds, higher altitudes and greater size of the new airliners require more electronic gear than carried now. Most of the new equipment will be more complex than the old. It will also be more expensive.

Cruising speeds near 600 mph require flush-mounted antennas designed to minimize drag. In some cases the cost of these installations comes to ten times that of equivalent exterior antennas.

Some airline companies, especially those planning overwater jet service, are interested in navigational dead-reckoning computers currently used in military aircraft.

There are two types. The simpler one gives only an indication of ground speed and drift angle. The more complex instrument supplies a constant reading of latitude and longitude and is tied into the plane's automatic pilot.

Jets' high speed also creates the need for a dependable proximity warning device. By the time the pilot identifies a tiny speck on his windshield as an oncoming plane, remedial action may be too late.

One system under development would simply notify the pilot that there is another plane in his danger zone. A more complex system would serve as an anticollision device. Besides warning the pilot, it would pinpoint the hazard while an electronic computer devised the best escape path.

Another piece of equippage to be seen on new jet airliners is the yaw damper. The plane's motion about a vertical axis has to be controlled if structural strain or passenger discomfort from excessive yawing are to be prevented.

Each damper must be custom designed for the particular model jet airliner on which it is used. Each must be tailored to that plane's own peculiar flight characteristics.

Weather radar for jets is the same as for propeller-driven aircraft. But it will play a more vital role. Air turbulence is a greater hazard at high air speeds.

Lockheed reports its Electra will make use of several servo-controlled instruments all of which will require electronic amplifiers.

Two of the most significant new electronic devices in the Electra are for propeller control and trimming control of engine fuel supplies.

Propellers are provided with electronic synchronizing and synchophasing devices that sequence propeller blade angles so that shock waves produced by the propellers do not reenforce each other when they hit the fuselage.

Electra's Allison turboprop engines are constant speed types. Fuel control is performed electronically. Thermocouples, used to maintain turbine inlet temperatures, schedule fuel flow. An amplifier and a newly designed electronic control circuit are required by each engine.

Under development by several firms are master flight-director systems to replace conventional instruments and reduce instrument-panel congestion. The flight-director will give computed information to the pilot. Probable cost is double that of conventional instruments.

AIR plan coming

THIS MONTH, White House aid Edward P. Curtis will disclose preliminary results of his year-long study of aviation facilities. Curtis, an Eastman-Kodak v-p on leave as special assistant to the President for aviation facilities planning, is principal speaker at the IRE's March 19 luncheon in New York's Belmont-Plaza Jhotel.

Curtis' ten-man systems team is figuring out all of the nation's long-range requirements—airways, navigational aids, communications and airports. Study details are being kept under wraps until the White House sees them. The report probably will recommend:

- Increased radar coverage and full use of computer techniques in traffic control.
- Rapid simplified data links to replace or augment voice communications between pilot and controller and among controllers.
- Integrated traffic control systems in congested areas served by several airports.
- Increased research and development aiming toward "a much more sophisticated approach" to the traffic problem.

The Curtis Committee's study grew out of a report in May, 1955, by Wallstreeter Wm. Barclay Harding to the Budget Bureau. The committee aims to evolve a 20-year plan for all civilian and military aviation facilities. As Curtis says, "progress is being threatened . . . by our own failure to provide adequate facilities" in the way of airport space and traffic control systems.

Commenting on air safety, Brigadier General Milton Arnold, v-p of the Air Transport Association, sees no adequate solution to the problem before 1965. Avionics, Arnold says, "is like a thoroughbred with too many owners," all of whom—military, commercial and private civilian—must agree before an answer can be found.

ACCELERATOR sales climb

Irradiation secure in plastics, promising in foods and chemicals

One firm moves to larger plant as sales treble in five years

Research accelerators get bigger and bigger

ELECTRONIC particle accelerators, already widely used in research, appear to be near broader industrial use as a radiation source. The next few years should tell the story.

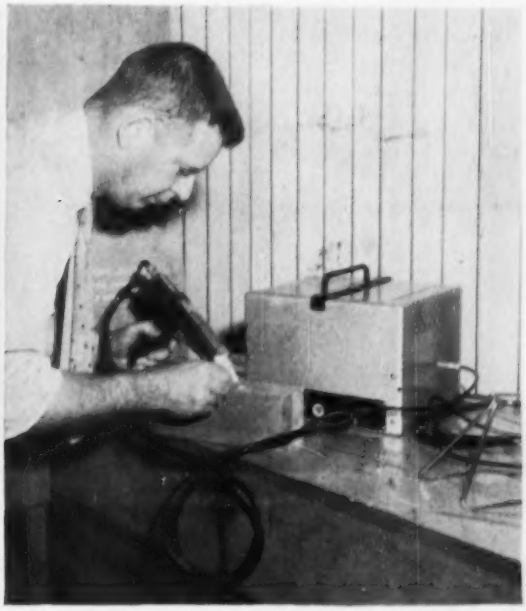
Accelerators have already achieved a small but secure place in plastics. X-ray type accelerators are well-established in medicine and industrial radiography. Laboratory reports show promise in food and drug sterilization and petroleum and chemical processing.

The sales record of High Voltage Engineering is an indication of market potential. Boosted primarily by research, this company's sales were $1,113,336 in 1952, $2,007,101 in 1955 and an estimated $3 million in 1956. It is moving into a new plant with facilities for testing 16 machines simultaneously.

High Voltage estimates 150 to 200 Van de Graaff accelerators, its principal product, are in use. GE has sold over 100 of its resonance-transformer x-ray units alone. These two firms are major producers. Varian Associates and Applied Radiation specialize in linear accelerators.

Quoted prices range from $35,200 to $1 million for Van de Graaffs, $50,000 to $118,000 for resonant

ULTRASONICS cleans and solders



IMMERSING transistors in ultrasonically agitated cleaning bath at Texas Instruments removes foreign matter. Equipment is Acoustica Associates generator with magnetostrictive nickel transducer. Man is using Mullard soldering iron. Sound waves carried to molten solder cut out need for flux

transformers and $100,000 to $500,000 for linear accelerators. Energy level ranges from 1 to 50 million electron volts.

Large research accelerators such as cyclotrons produce billions of electron volts of radiation by whirling nuclear particles within a field. The AEC is constructing 6-bev and 3-bev synchrotons for $6.5 and $5.8 million.

GE so far has sold 10 resonant transformers—to itself and Sequoia—for cross-linking polyethylene plastic by irradiation. The technique is expected to do for polyethylene what vulcanizing did for rubber.

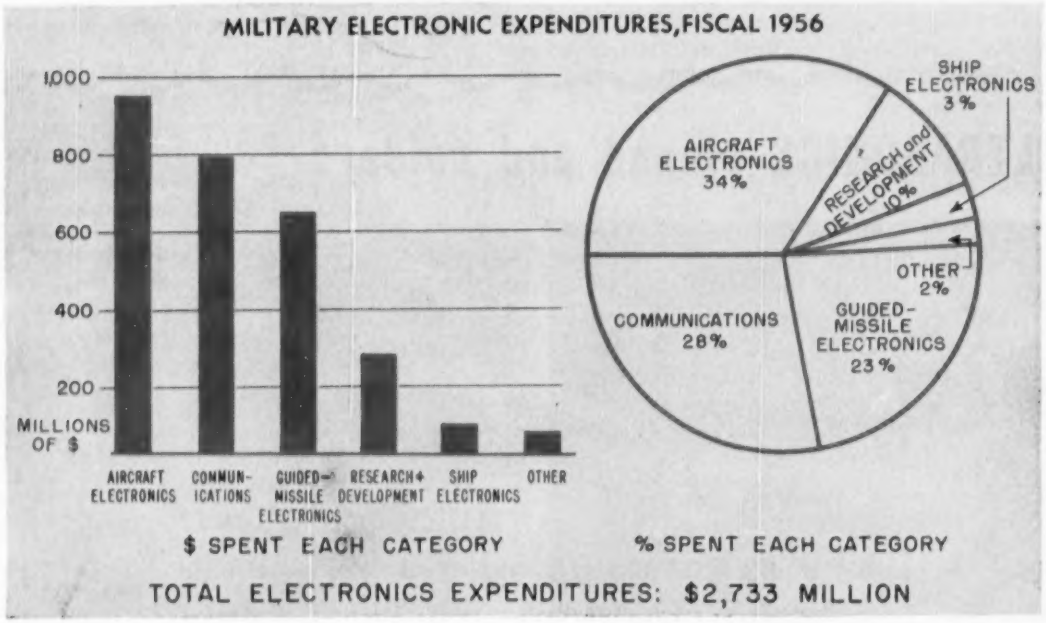
Food researchers are proving that food is easily preserved by irradiation sterilization. But some irradiated foods have been kept off the market by a flavor problem. Straws in the wind, however, are Army plans to build a pilot plant in 1958, a Michigan State College report that grains can be deinfested and sterilized for storage at 1.5 cents a ton for electricity, and purchase of a half-interest in Applied Radiation by a major food processor.

Research is underway in chemical fields. Radiation is able to start chains of chemical reaction. Radiation Applications, one of several firms renting research facilities, estimates $50 million has been invested in radiation chemistry.

Drug and surgical supply firms are turning to irradiation as a way to sterilize their products after packaging. Johnson & Johnson is reported to be making heavy investments. Hospitals have successfully used irradiation to preserve artery banks.

Petroleum firms hope irradiation will be more efficient than heat for cracking gasoline molecules.

PRODUCTION and SALES statistics



The electronics industry share of Department of Defense procurement expenditures in the fiscal year ending June 30, 1956 amounts to $2.7 billion, RETMA reports. Amounts spent in individual categories range downward from electronics used in aircraft with $925.0 million to electronics for ships with $80.0 million.

Percentagewise aircraft electronics accounted for 34 percent of the fiscal 1956 total, communications 28 percent, guided missles 23 percent, research and development 10 percent and ships 3 percent.

This breakdown of DOD expenditures is based on a formula worked up by RETMA's marketing data department. It is estimated that the figures are accurate within one percent.

Television set shipments to dealers during the first 11 months of 1956 total 6,051,266 and compare with 6,621,786 receivers shipped during the same period in 1955. The 617,516 tv receivers shipped to dealers during November were below both the 843,508 receivers shipped in October and the 634,742 receivers shipped in the month of November a year ago.

COMPUTER schools boost sales

Selling computers is a lot like selling sewing machines,

It pays to teach the prospect how to use one

Classroom selling can move other electronic items

THE THREE R's have a new meaning in the electronics industry: Reading, 'Riting and Revenue.

Companies sponsoring schools for computer customers are learning an important lesson. It pays to conduct classes. Schools boost sales.

Comparatively speaking, the idea is an infant in a giant industry. It may spread and grow fast.

Says Edward L. Gilfix, customer training supervisor of DATAmatic, a Newton, Mass. computer manufacturer: "Our classrooms play a key role in all sales."

The firm makes a $1.75-million automatic data processing machine, and a customer school is almost mandatory. But smaller manufacturers can put the school plan to use profitably. It works this way:

Three courses are offered. They last two days, two weeks and six weeks.

The two-day course is a general familiarization course for top executives. The two-week program is for ranking systems-and-methods personnel of a company. They are sent to learn about the machine and weigh its potential value to their company. The six-week course is for persons who will actually run the machine.

"Because our product is complicated," says Gilfix, "we use the first two days to show our students the forest. The rest of the time we show them the trees. And, in the last lecture, we tie the trees together to show how the forest is composed."

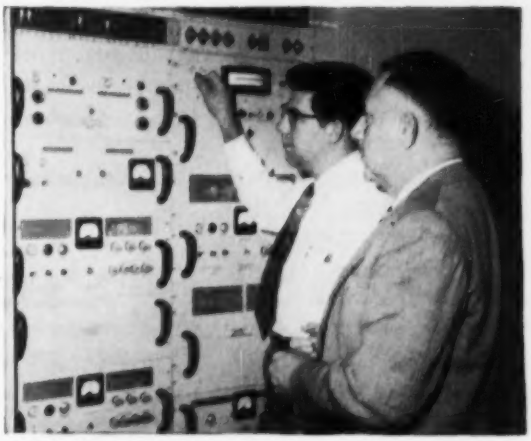
Students attend the school only by invitation. Hotel arrangements are made for them. They are picked up and returned daily.

This is a unique school. No student takes notes. All he does is listen.

But he gets a complete set of all lectures. This he keeps. Later, at his company, he may use the bound volume of lecture notes for reference.

CUSTOMER briefed on school . . .

THEN sits in on lectures . . .



AND gets pointers from expert computer operator

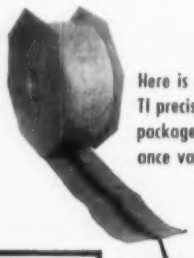
TI MIL-Line Precision Resistors

HOLD TOLERANCE...EVEN WHEN DRIPPING WET!

Soaking wet, dried out, or 'shook up' – TI MIL-Line deposited carbon resistors still far exceed MIL-R 10509B . . . emerge from one acceptance test after another – by major electronics manufacturers – with performance records that have not been equalled. *It's the seal that makes the difference* . . . an exclusive Texas Instruments process that snugly wraps these precision resistors in tough jackets of a special coating with high dialectric strength.

For ease in design, production, and maintenance . . . for improving the reliability and saleability of your products, the moisture resistance of TI deposited carbon MIL-Line resistors is just *one* field-proven factor. You also get a choice of 1, 2, or 5% tolerances . . . high stability over wide temperature ranges and under full load . . . low negative temperature coefficients . . . negligible voltage coefficient and noise levels . . . long shelf-life . . . wide selection of sizes and resistance values . . . reasonable prices . . . and, if desired, reel-type packaging for automation.

Visit our booths No. 2816 to 2820 at the 1957 I.R.E. Show, New York



Here is a typical TI reel pack designed to speed production. TI precision deposited carbon resistors are mass produced and packaged in five sizes from ½ watt to 2 watts with resistance values from 25 ohms to 30 megohms.

For complete data, write for Bulletin DL-C 539.

TEXAS INSTRUMENTS
INCORPORATED
6000 LEMMON AVENUE DALLAS 9, TEXAS

BACK DOOR to front office

Management consulting services now widely used
Growth industries have particular need
Most electronics problems involve specialized marketing

ELECTION of management consultant John L. Burns to succeed Frank L. Folsom as president of RCA spotlights the current eminence of the management consulting profession. Burns is a partner in Booz, Allen & Hamilton, a top-drawer consulting firm that has worked with RCA for a number of years.

In 1955 Mark W. Cresap became heir apparent to the presidency of Westinghouse when he was promoted from vice president to executive vice president. Before joining Westinghouse he had worked for the company as a management consultant in the firm of Cresap, McCormick and Paget.

There are about 3,000 management consulting firms in the U. S. grossing about $500 million a year in fees. Over 70 percent of American businesses make use of their services.

"The small company which is growing into a medium-sized company or the medium-sized company which is growing into a large company is most likely to need outside counsel," states the Association of Consulting Management Engineers.

Most immediate consulting need of electronics firms is help in solving marketing problems, consultants say. Many firms aim to achieve a 50/50 balance of military and commercial business for greater business stability and larger profits.

A combination of a technical sense and a commercial sense is needed in making the shift to production for civilian use, says Warren B. Riley of the consulting firm of Will E. Hill.

Answers must be found to such questions as: What is the market potential? Who are the potential customers? What are their requirements?

Evaluating the effectiveness of marketing management in electronics companies is becoming an increasingly important problem for consultants, says Alexander Hollenbeck. He heads a consulting firm specializing in component manufacturers.

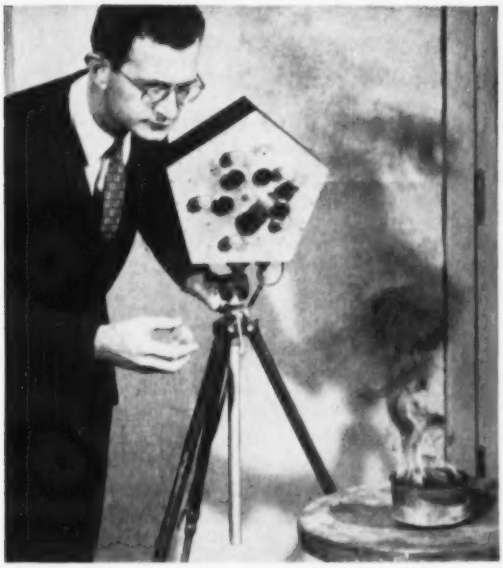
Small firms may be in greatest need of part-time management aid but often do without because they cannot afford the fees: $85-$100 a day for junior consultants and $300 and up for seniors.

One consulting firm reports considerable success in meeting this problem by charging less than its usual fee on a first assignment from a small company. The original job often leads to other jobs on which full fee can be charged.

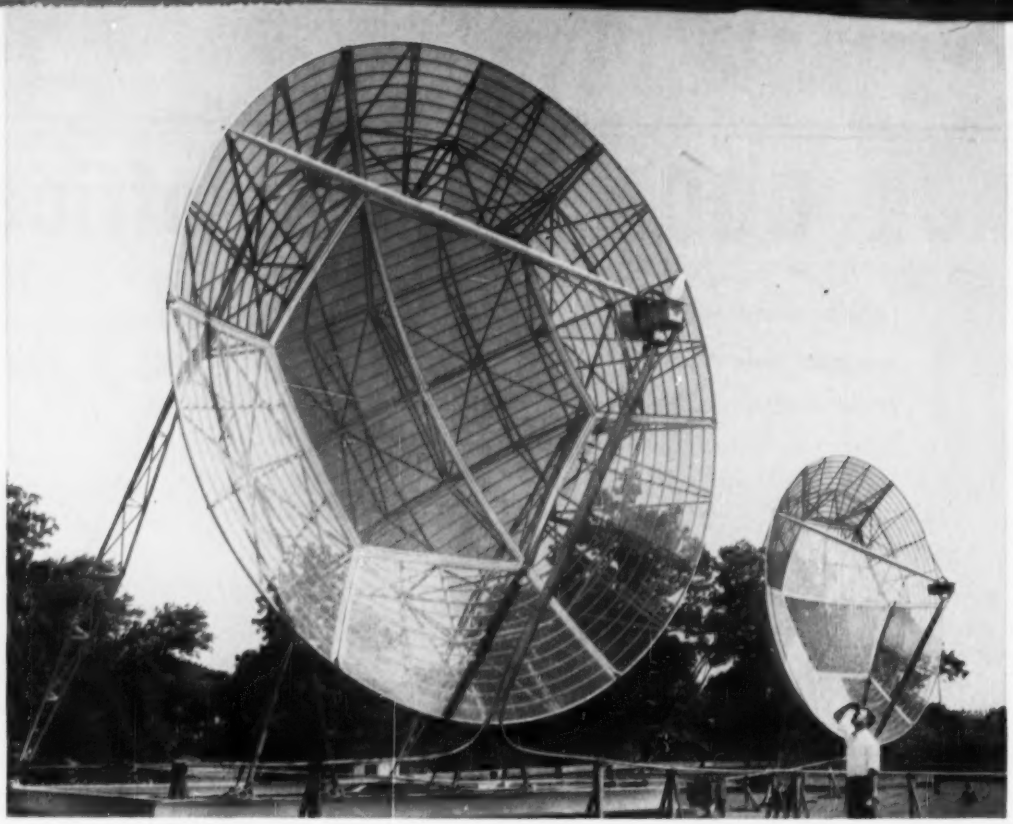
Best use of management consultants by the electronics industry poses special problems because of the technical nature of its products and the preponderance of technical personnel. The W. E. Hill organization claims consultants need not be engineers, but must have technical understanding.

The American Management Association has recently published a directory of 427 consulting organizations drawn from its list of AMA members.

Foolproof flame DETECTOR?



PHOTOELECTRIC equipment and multichannel recording oscillograph are used by the National Bureau of Standards in the hunt for a foolproof device to detect flame in aircraft. Facts discovered about flames will lead to design specifications



DISH-SHAPED ANTENNAS like these have been used by IT&T in tests of beyond-the-horizon uhf telephone transmission prior to commercial use of the new technique this year

SCATTER invades telephony

Tropospheric scatter makes its commercial debut this year
Companies to open links in Western Hemisphere and Europe
Military spending for scatter continues high

Beyond-the-horizon microwave radio transmission will achieve a real commercial breakthrough in 1957. Tropospheric scatter will come into its own for commercial telephone use in the Western Hemisphere and in Europe.

International Telephone and Telegraph will have at least two beyond-the-horizon telephone and teleprinter links in operation during the year.

The company has successfully completed tests between Puerto Rico and the Dominican Republic, a distance of 238 miles, and between the Mediterranean islands of Minorca and Sardinia, a distance of 240 miles. Operational equipment is being installed.

Federal Telecommunications Laboratories, an IT&T subsidiary, developed and produced equipment for both links.

American Telephone & Telegraph and IT&T will jointly open a 185-mile beyond-the-horizon link between Key West, Fla. and Havana, Cuba in the second half of 1957. Four antennas that measure 60 feet across and are shaped like outdoor movie screens will be used.

IT&T is conducting other tests of beyond-the-horizon microwave transmission to determine if it is feasible between Buenos Aires, Argentina and Montevideo, Uruguay and also between Port-au-Prince, Haiti and Ciudad Trujillo, Dominican Republic. The distances are 110 and 170 miles respectively.

These tests will probably be completed sometime in 1957 with commercial operation not far off. Sev-

eral other tests are planned at undisclosed locations outside the U.S.

Federal Telephone & Radio, another IT&T subsidiary, expects to manufacture close to $10-million worth of beyond-the-horizon equipment in 1957. The company believes the commercial prospects for this type of transmission are very large.

Commercial use of beyond-the-horizon uhf telephone transmission within the continental limits of the U.S. is in doubt because of the problem of interference with line-of-sight radio, including regular tv broadcasting.

However, its use as a substitute for submarine cable will spread to many parts of the world where communication across water is necessary. Tropospheric scatter will also find new commercial application over rugged terrain where it has been uneconomical to build and maintain land lines or line-of-sight microwave relay towers.

The airlines and the petroleum industry are among the potential customers for tropospheric scatter systems.

For the last five years, the military has had almost exclusive call on the new tropospheric scatter technique.

An early beyond-the-horizon system was Pole Vault in Newfoundland. The DEW line also uses this type of communications system.

Military spending for beyond-the-horizon transmission equipment is likely to continue at a high level for some years to come, although at not as high a rate as in the past two years. One new area of military interest is in mobile beyond-the-horizon equipment that can be used as a substitute for land lines. Such a system would be easier and less hazardous to set up and maintain under combat conditions.

TROPO bolsters defense

Tropospheric scatter is one of the keys to the defense of the North American continent, furnishing communications between some 6,000 miles of radar stations from Alaska to Canada.

First air defense warning use of beyond-the-horizon transmission was planned in 1952. Tests in Newfoundland from 1953 to 1954 over distances of 170 and 290 miles proved the reliability of uhf transmission far beyond line-of-sight paths.

"White Alice" in Alaska is the largest beyond-the-horizon system ever built. It consists of 33 transmitting and receiving sites, covers 3,100 route miles and cost more than $100 million. Prime contractor was the Western Electric, as in the case of the DEW Line which stretches about 3,000 miles from Alaska to Baffin Island.

A new contract has been awarded to Western Electric to extend the DEW Line detection and communication systems west from Alaska out along the Aleutian Islands. DEW Line communications also tie in with the Mid-Canada and Pine Tree radar lines further south and with coastal and offshore radar sites.

Technical DIGEST

Use of peltier effect to cool transistors is under investigation by Irving Cadoff at New York University. Current is sent through thermocouples surrounding or mounted inside the transistor envelop to produce cooling. Success would mean elimination of blower systems for transistor equipment in high-temperature environment of missiles and aircraft.

Antenna hooked to Ampex video recorder caught every local broadcast station on air, plus a few short-wave stations up to 4-mc limit of recorder. With tuner for playback, desired station can be sorted out and heard later. Possible applications include FCC monitoring, checking of commercials, censorship, guided-missile and radar countermeasures.

Transistors reduce battery cost in electric-fence units. A German design uses two transistors in push-pull to charge two capacitors through a high-voltage transformer. When bull nuzzles fence wire he gets 5,000-v pulse through his nose.

Rural-carrier telephone repeaters using transistors are sealed in metal case atop poles at Yuma, Arizona. Temperature rises only 10 F even under blistering 140 F. Secret lies in so-called chimney design that allows continuous air circulation. Without encircling chimney, internal temperature rises 40 F.

Square-wave electromagnetic flowmeter for use during heart surgery measures flow of blood in artery or vein without tapping it.

Sparrow air-to-air missiles have three different types of guidance. Sparrow I is completely passive beam rider. Sparrow II is completely active, with its own homing radar. Sparrow III is semiactive, being launched under guidance of mother aircraft and using own homing unit to make the kill.

RAILS look to electronic future

Spend millions on freight classification and traffic control
More television used at yard entrances and terminals
Data processing systems look promising

COMPUTERS, radar and electronic signaling are helping put the nation's rail carriers on the road to greater operating efficiency and profits.

Railroad expenditures for signaling equipment rose from $37.8 million in 1954 to $45.6 in 1955. How much was electronic is anybody's guess. But the electronics share is growing.

At least a dozen firms are supplying specialized electronic equipment to the railroads.

Millions of dollars are being spent on yard modernization, including electronic gear for classification of freight cars. Millions more are spent on electronic centralized traffic control.

Television is finding increased use at yard entrances to read car numbers for a clerk who may be miles away, as well as in speeding information on space reservations.

• New York Central's main line from New York to Chicago will be under centralized traffic control by 1963.

• In Buffalo, an electronically controlled freight yard on the Central moves cars in 7 instead of 25 hours. Cost: about $10.6 million. The yard can receive and switch 3,000 cars a day.

• The Pennsylvania will complete its $34 million Conway classification yard near Pittsburgh, probably by the summer. The 4½ mile yard will use computers in its 9,000 car-a-day classification system.

• New York Central plans two freight yards to cost $21 million total, at Elkhart, Ind. and Youngstown, O. They will be completed late this year or early in 1958. Weather-proof tv cameras and tape recorders will be used in addition to radar and computers.

• Electronic car reporting—using a yard-to-yard automatic teletypewriter system and IBM computers—can flash the location of any of 120,000 freight cars on the New York Central.

• General Railway Signal Co. offers a yard classification system said to give automatic control of freight-car speed and routing through radar and electronic computers.

• Union Switch & Signal offers an electronic car classification system which makes use of high-speed analog computers.

• Reeves Instrument and the Union Pacific Railroad have devised an electronic control system for the railroad's North Platte, Neb. freight yard. A pilot system has been in use for more than two years, is being extended to entire yard.

• Electronic centralized traffic control used by the New York Central cuts need for four tracks to two over the 163 miles between Buffalo and Cleveland. Cost: about $6.2 million.

• Infrared detectors to spot overheated journal bearings are being used on the Rock Island.

• Louisville and Nashville has undertaken an $8.5-million freight yard at Boyles, Ala. that will have a 105-foot electronic track scale, closed-circuit tv and a paging and talk-back system.

Electronic equipment may provide the railroads with a way out of the dilemma of high fixed costs and shrinking revenue. New control systems can reduce trackage while improving service.

TV, FAX sell tickets

ELECTRONICS is the railroads' ticket to merchandising passenger transportation. Last month a mammoth ticket sales and service bureau opened in New York's Pennsylvania Station. It uses:

• Closed-circuit tv installation using 105 cameras, 101 receivers, 60 miles of coaxial cable, provided by Dage Television division of Thompson Products.

• Three facsimile services provided by Western Union—Ticketfax for transmitting a ticket facsimile to a counter in another city; an Intrafax link with the road's central office in Philadelphia to which blocks of unsold space can be flashed at train departure time; and an Intrafax network by which firms in New York can send requests and receive tickets.

• An electronic longhand system provided by Tel-Autograph Corp. which permits 72 telephone reservation clerks to transmit written requests on reservation forms to the ticket center.

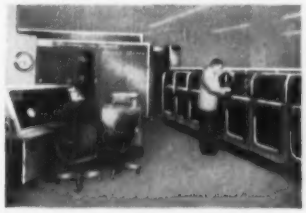
CLEVITE
T—P

JAN Types
High Temperature Types
High Conductance Types
High Resistance Types

All CLEVITE gold-bonded subminiature glass diodes feature high forward conductance . . . high inverse resistance . . . fast pulse recovery . . . and fast forward switching time.

CLEVITE gold-bonded diodes are now used by the nation's leading computer manufacturers. If you have similar requirements, our engineers will be glad to discuss them. Contact us for complete information and data sheets.

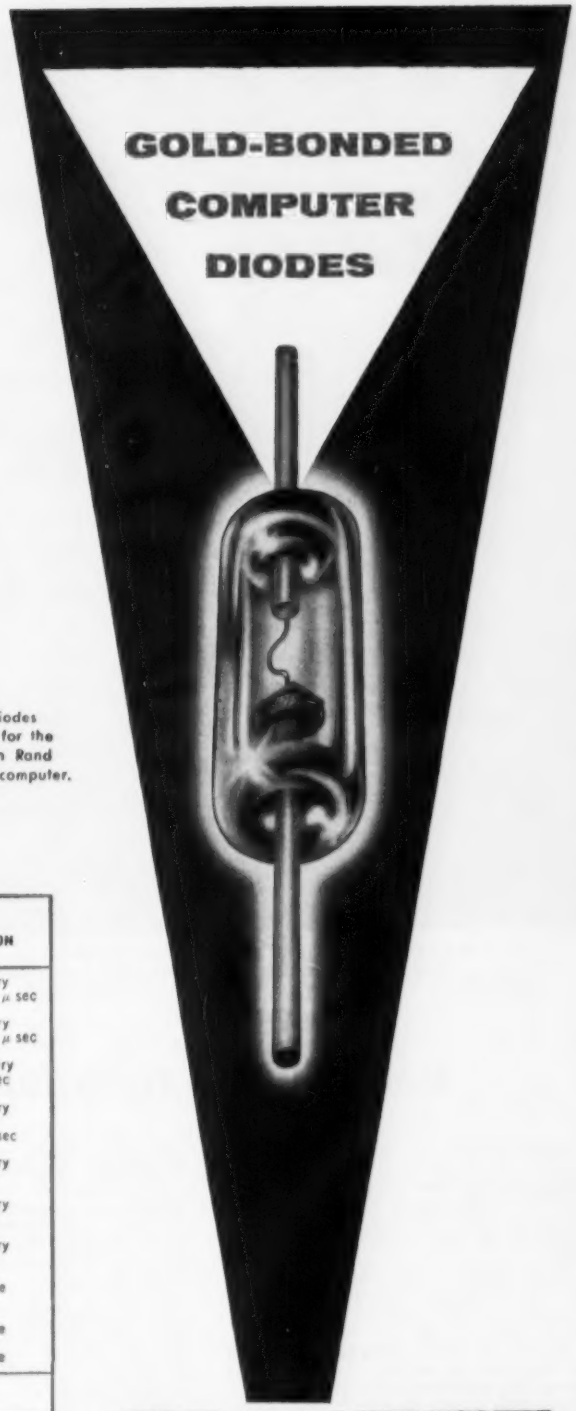
See us at the I.R.E. Show, Booths 2616-2626



Clevite diodes are used for the Remington Rand UNIVAC computer.

CHARACTERISTICS

TYPE	Forward Current at +1V (ma. Min.)	Inverse Current at Specified V (μa. Max.)	Continuous Inverse Operating Voltage	DESCRIPTION
CTP-301	40	25 @-50V	50	Inverse recovery time meas. 1.0 μ sec
CTP-307	300	20 @-30V	40	Inverse recovery time meas. 1.0 μ sec
CTP-309	300	20 @-6V	20	Forward recovery time 0.1 μ sec
CTP-318	50	500K between -10V & -50V	60	Inverse recovery time 0.3 μ sec Forward 0.1 μ sec
CTP-319	150	500K between -20V & -90V	90	Inverse recovery time 0.3 μ sec
CTP-320	5	50 @-50V	80	Inverse recovery time 0.3 μ sec
CTP-328	7.5	500K between -10V & -60V	60	Inverse recovery time 0.3 μ sec
IN34A	8.5	30 @-10V 500 @-50V	60	General Purpose
IN279	100	200 @-20V	30	General Purpose
IN116	5	100 @-50V	60	General Purpose
Available JAN Types — 1N127, 1N128, 1N198, 1N277, 1N281				



CLEVITE
TRANSISTOR PRODUCTS

241 Crescent St., Waltham 54, Mass. TWinbrook 4-9330

A Division of Clevite Corporation

Other Clevite Divisions

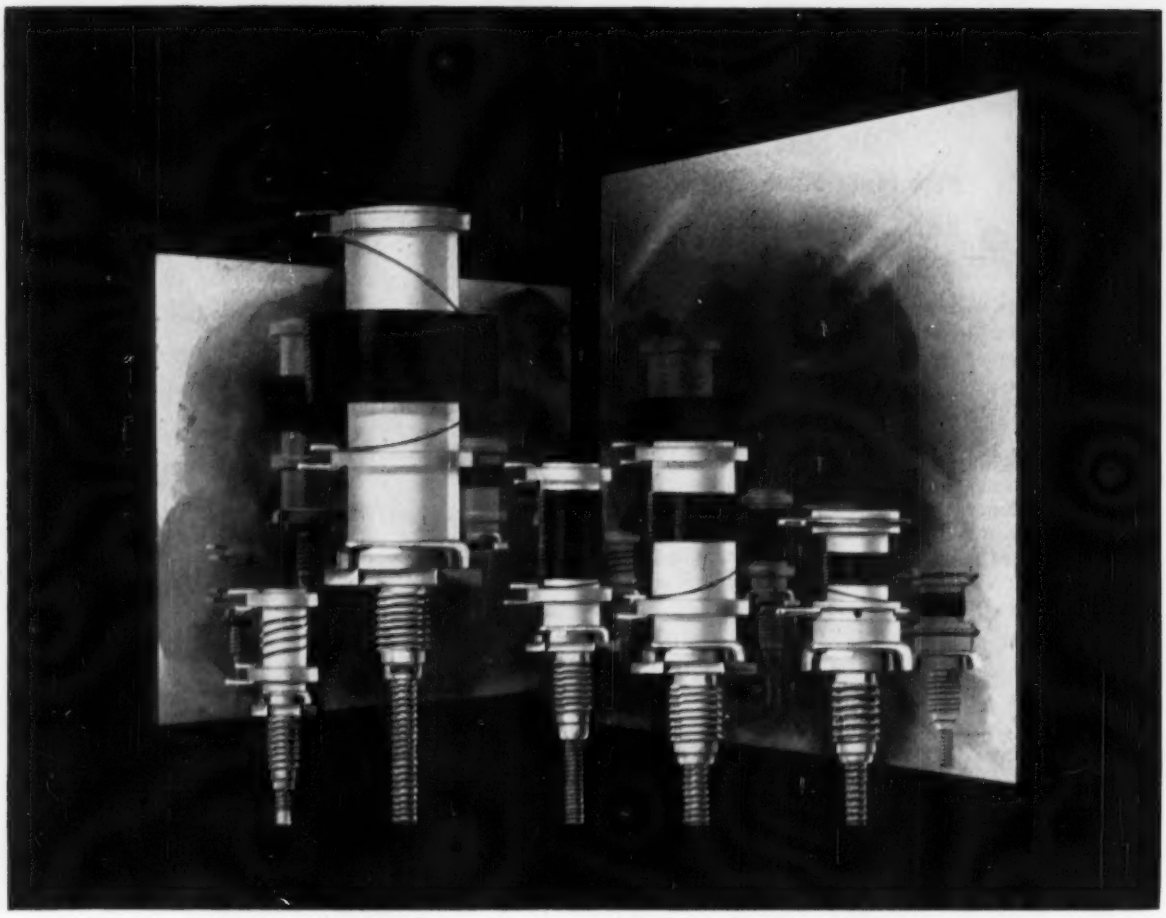
Brush Electronics Co.

Cleveland Graphite Bronze Co.

Clevite Harris Products Inc.

Clevite Ltd.

Clevite Research Center



CTC coil forms with Perma-Torq* Tensioning Device are designated PLST, PLS-6, PLS-5, PLS-7, PLS-8 and are factory assembled to mounting studs. The units are completely interchangeable with CTC's LST, LS-5, LS-6, LS-7 and LS-8.

Reliability is their family resemblance

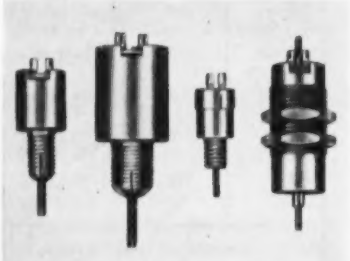
Here's a reliable family of coil forms ready to meet your specifications. These Perma-Torq Tensioning Devices on CTC coil forms allow locking of tuning cores while still tunable — and you can depend upon them to do their job well.

This built-in dependability is a result of CTC's unique design plus quality control — that meets or betters government specifications.

Perma-Torq is a compression spring of heat treated beryllium copper, that has a very high resistance to fatigue and keeps coils tuned as set — even under extreme vibration and shock. The device also allows for immediate readjustment — without removal or loosening of any mounting nut or locking spring.

Quality control and features like the above are just two of the reasons why CTC can offer you guaranteed standard or custom electronic components — whose performance you can rely upon.

CTC researchers and practical experts are always available to help you solve your component problems. For all specifications and prices, write Cambridge Thermionic Corporation, 437 Concord Ave., Cambridge 38, Mass. West Coast stocks maintained by E. V. Roberts and Associates, Inc., 5068 West Washington Blvd., Los Angeles 16, and 61 Renato Court, Redwood City, California.



CTC miniature shielded coil forms are rugged and perfect for "tight spots." The LS-9 is 1/16" diameter 1/2" high. LS-10 is 5/16" diameter x 1 1/16" high. The LS-11 is 3/16" x 17/22. The LS-14 is double ended and is 1/2" OD, 1 and 3/4" overall in length. All are highly shock resistant with mechanically enclosed protected coil windings. The units are ideal for use with IF strips or as RF coils, oscillator coils, etc. Available as coil form assemblies or wound to your specifications.

*Patent pending.

CTC

CAMBRIDGE THERMIONIC CORPORATION

makers of guaranteed electronic components
custom or standard

SPECIAL MARKET REPORT

DIGITAL COMPUTERS

Youthful industry catapults skyward
Sales for 1957 will approach $200 million
Surface is barely scratched

WHEN Census Bureau bought a Univac in 1950 they suspected they were opening up a new industry but weren't sure. In three years they were positive. Acceptance by the business world of digital data-processing proved that enormous pressure had been building up for years for a new way to handle statistical information.

In 1953, overall sales of stored-program general-purpose digital computers grossed a slim $10 million. In 1956, according to RETMA, sales reached $100 million. There were half a hundred producers. Prospective users could take their pick of a wide range of shapes, sizes and capabilities.

LORELEI VOICES lure computer experts to greener pastures as manufacturers bid for brainpower

This year, the industry expects to rack up sales of $200 million. Production capacity will increase 30 percent. Manufacturers will continue to be on the lookout for men in all categories: design, engineering, production, programming and sales. In the words of a man from Burroughs, the computer business is "in a tremendous state of flux."

PRODUCTS—Manufacturers generally class their general-purpose equipment as data-processing or scientific computers. These are also classified as small, medium or large-scale.

Data-processing computers usually use some sort of internal code that can match an alphanumeric (*alpha*betical-*numeric*) input, and have versatile input-output auxiliaries. Scientific computers use a binary code, attain higher computing speeds, have limited and uncomplicated input-output facilities.

The size distinctions are not universal. Usually they're based on selling price. General-purpose computers range from $10,000 to $5 million. Those in the 5-figure range are considered small; medium-sized ones cost upwards of $100,000 and any system costing $1-million or more is considered large-scale.

In addition to the market for these general-purpose stored-program machines, there is a market for the so-called special-purpose computer. These machines are permanently programmed to do a specific job, such as keeping track of airline passengers' space reservations, department-store inventory, tolls on superhighways or railroad iron-ore shipments. Prices vary depending upon the complexity of the job and the amount of information to be stored.

PRODUCTION—So far, computermakers have turned out about 700 small digital computers, 600 medium-sized ones, and 200 large-scale systems. Of the general-purpose systems being marketed, almost half are giant systems, some costing in excess of $3 million.

Concentration on large-scale systems is due to several factors:

- Big business is getting bigger, and its data-processing problems more intense
- The most pressing problems are big ones that can't be solved in reasonable time by a reasonable number of people by anything but a big computer
- There's more return per dollar from large-scale systems, and will be until computers become easier to build and sell.

MARKET—In this hotly competitive industry, manufacturers hesitate to discuss market potential. Few want to disclose their hard-won market evaluations.

Available estimates vary widely. J. B. Rea, maker of Readix, figures the total potential market for medium-sized computers at over $5 billion; more conservative guessers figure it for $2.5 billion.

Datamatic president Walter Finke appraises the total current market for large-scale systems at about $2 billion, thinks half of that will be contracted for in the next three years. A manufacturer with a somewhat more hardbitten view of this field sees the market as $1.5-billion, of which a billion dollars' worth will have been installed by 1965. Total industry production capacity for million-dollar systems is 150 a year, expandable to perhaps 250 by 1960.

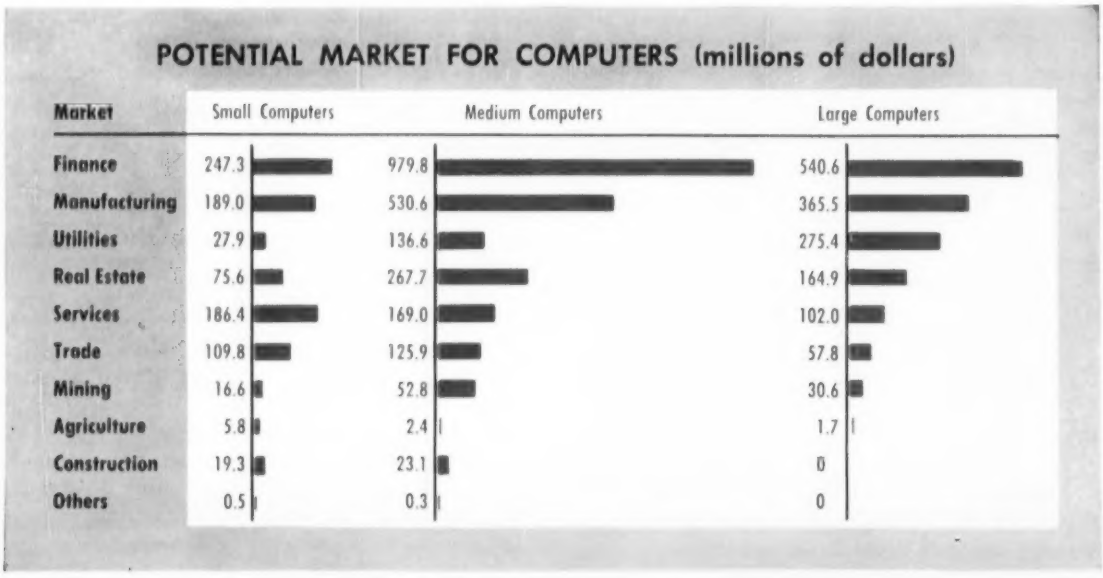
Almost 50,000 U.S. businesses are prospective customers for systems in the 5-figure range, not to mention government prospects and research institutions. To these must be added companies in the higher brackets who would rather buy several smaller systems than one big one. Together these groups represent a possible $3-5 billion market.

PATTERNS—On the basis of their gross assets, 90 percent of U.S. profitmaking concerns possibly cannot afford a computer costing even $10,000. Of the 56,000 companies left, 87 percent can afford a small computer, about 11 percent could buy a middle-sized one and about 2 percent can plunk down $1 million or more for a giant system.

Two factors blur these market distinctions. First, something over four-fifths of the existing computer installations are rented, and rentals make larger systems available to smaller companies. Second, a growing economy moves the pattern upward, although an economic downturn would not necessarily slide the pattern down.

FINANCE—Biggest potential market for computers of all kinds is the money business, which boasts 17,000 banks, insurance companies and other financial institutions that can afford some kind of office automation. Of these, about 320 have enough money to buy big—a third of all the U.S. companies that can. Furthermore, most of these companies need some kind of fast, efficient data-handling machinery, and need it badly.

So far, about one-sixth of all computers have gone to work in the world of finance. Banks are not buying too heavily as yet, partly because most computing systems are not readily adaptable to their bookkeep-



POTENTIAL MARKET FOR COMPUTERS

(Units)

MARKET	Small Computers	Medium Computers	Large Computers	Total Units
Finance	13,740	2,840	318	16,898
Manufacturing	10,500	1,538	215	12,253
Utilities	1,550	396	162	2,108
Real Estate	4,200	776	97	5,073
Services	10,360	490	60	10,910
Trade	6,100	365	34	6,499
Mining	920	153	18	1,091
Agriculture	321	7	1	329
Construction	1,072	67	0	1,139
Others	29	1	0	30
Total	48,792	6,633	905	56,330

ing problems without a wholesale overhaul of check-printing and check-writing procedures. Insurance companies are buying heavily, however.

MANUFACTURING—One-fourth of all computers have been put to work in the manufacturing industries which, coincidentally, also make up about a fourth of the prospective market. Food, chemical, petroleum and primary metals industries are the best bets, for they have the highest incidence of strong corporations with big payrolls, big research problems, big accounting jobs.

SERVICES—Service organizations include over 12,000 business services, a big portion of whose assets are in processing equipment. Service classification also includes several thousand schools and colleges which may buy various types of computers. The market represented by this area of activity is out of proportion to the gross wealth which it possesses. As many as 10,000 computers may ultimately be installed in service organizations, of which 50 or more may be large-scale machines.

GOVERNMENT—The Federal government has pushed the development of digital computers, continues to subsidize some research and buy production. About a third of all digital computers are in Federal or state government hands, the majority working on defense projects. Which way this market will go is anybody's guess. Industry safe-siders think it can only ease off, hope for firmer industrial and commercial markets before then.

COSTS—Major costs in the industry are distributed in an unusual pattern:

- Research, development and engineering may eat up the profits from the first ten or more large-scale systems, proportionately more of the smaller systems. Some companies are pouring 1960's profits into today's improvements.

- Production and parts: most manufacturers have cut production expense to 45 percent of factory-door value. Cheaper components would reduce the remaining 55 percent, but low-cost components and high product reliability seem mutually exclusive.

- Sales expenses are a tremendous factor in the selling price. The cost of the sales effort has been known to exceed a quarter of a million dollars for a single large-scale computer.

Datamatic estimates its direct sales expense at 10 to 13 percent of selling price. Another sales manager estimates 15 percent, a third 8 percent. These costs will remain high so long as buyers are not familiar with computers and what they can do.

TREND—In design, computers are going three ways at once. Big computers tend to become larger and more generalized. The distinction between scientific and commercial computers is blurring, may eventually disappear. 1960's large-scale system probably will:

- Use binary code for ultrahigh speed
- Possess many flexible input-output and communicating auxiliaries
- Be programmed by automatic coding
- Use solid-state circuits
- Actually be several computers in one

Medium-sized computers are meanwhile evolving into information-retrieval devices. Such computers are adept at file-maintenance, inventory control and similar problems.

Small computers are becoming more highly specialized. Manufacturers are finding it easier to sell a specific application than a general-purpose computer in this class.

1965—Within the next eight years, barring economic catastrophe, computermakers should be able to approach a 75 to 80-percent saturation of the current market. From then on, only a reduction in equipment cost can increase the market potential appreciably. After the market stabilizes, the major emphasis will be on replacing obsolescent systems. This should mean $400-500 million annually.

The obsolescence factor is high in the computer business and should remain high as computer technology advances, as pressure continues to rise for rapid, accurate solution of man's scientific, economic and sociological problems.

Why use a $14.25 crate where a $2.50 skid will do? Ship United!

By taking full advantage of United Air Freight economies, you *save on shipping charges.*

For example: Skid and a crate for this 300-lb. electric motor would cost $14.25. Shipped by expedited surface carrier from New York to San Francisco, total cost is $83.49. Shipping time: 4 to 6 days.

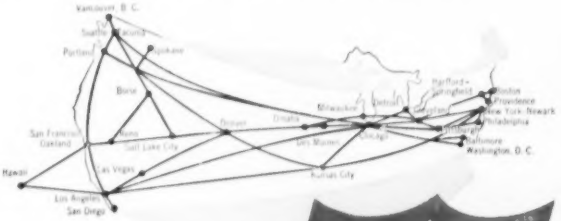
By United Air Freight, the same motor requires skid only ($2.50). Total cost of shipment is $82.30. Shipping time: 24 to 36 hours.

And consider these advantages—DC-7 Mainliner flights and 30,000-lb.-capacity DC-6A Cargoliners coast to coast, Reserved Air Freight (guarantees the space you need on the flight you want), single simplified airbill, other United "firsts."

Examples of United's low Air Freight rates

	per 100 pounds*
CHICAGO to CLEVELAND	$4.78
DENVER to OMAHA	$6.42
NEW YORK to CHICAGO	$7.50
SEATTLE to LOS ANGELES	$12.02
PHILADELPHIA to PORTLAND	$24.15
SAN FRANCISCO to BOSTON	$27.00

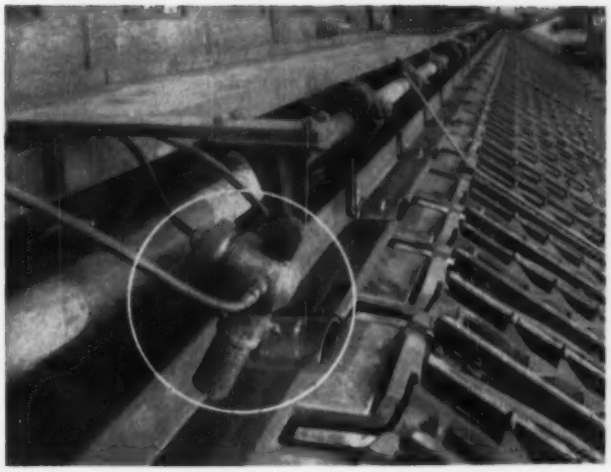
*These are the rates for most commodities. They are often lower for larger shipments. Rates shown are for information only, are subject to change, and do not include the 3% federal tax on domestic shipments.



Door-to-door service

SHIP FAST...SHIP SURE...SHIP UNITED AIR LINES

For service, information, or free Air Freight booklet, call the nearest United Air Lines Representative or write Cargo Sales Division, United Air Lines, 36 South Wabash Avenue, Chicago 3, Illinois.



WATER-COOLED phototubes control kickoff to hotbed

PHOTOTUBES up steel output

- Function in rugged environment
- Control high-speed bar and rod mill
- Increased production results

"ELECTRONICS can do anything," according to L. T. Rader of GE. "Even the problem of operating under adverse environmental conditions in industrial applications is gradually being overcome."

Phototubes used for controlling a rolling mill are another example of electronics in industry. The advantages of electronic control—less waste, greater speed and a more uniform end product—are typical.

A 10-inch combination bar and rod mill in Bethlehem Pacific Coast Steel's Los Angeles plant was designed to produce a wide variety of sections. The sections are delivered by a conveyor to the hotbed. Phototubes serve three functions in the operation.

Water-cooled tubes control disk-type shears that cut the bar to hotbed length. The tubes can be moved anywhere along the hotbed. A calibrated timer allows for minor adjustments without requiring that an operator walk along the top of the hotbed to change the positions of the tubes.

As the hot bar or rod is carried along the conveyor at high speed, it interrupts the light to the first shear control tube. A relay is actuated, setting up the shearing operation. A second tube controls cutting.

Errors of less than 1 foot are said to result with this arrangement. With the system it replaces, errors of 10 feet were not uncommon.

Operation of kickoffs to transfer the bars from the run-in conveyor to the hotbed is also controlled by water-cooled phototubes. The interruption of light to the tube by the bar initiates the kickoff action, which occurs after time delay.

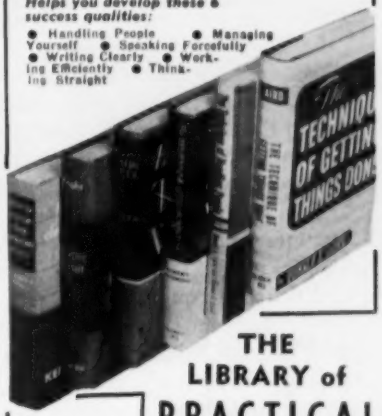
Lift repeaters, to guide bars from one stand to the next, are controlled by phototubes. Net result of all this: Upped production.

For your immediate use
the 6 most vital assets
to insure your
EXECUTIVE SUCCESS

SUCCESSFUL executives will tell you this simple fact: certain *key abilities* practically allow a man to write his own paycheck. And one doesn't have to be born with these proven executive qualities—they *can* be self-developed to a degree you may never have thought possible—easily, and *without* long years of study. You can help yourself acquire them with this specially selected Library of practical executive techniques.

The six books comprising this Library have been selected by successful executives as the ones *most useful* in developing the six qualities of executive success.

Helps you develop these 6 success qualities:
● Handling People ● Managing Yourself ● Speaking Forcefully ● Writing Clearly ● Working Efficiently ● Thinking Straight



THE LIBRARY of PRACTICAL EXECUTIVE TECHNIQUES

● 6 volumes ● 1633 pages
● $20.00—payable $4.00 in 10 days, then $4.00 a month

You'll find here the best thinking on a variety of important executive techniques . . . like getting the best out of your associates, putting your thoughts down clearly and forcefully on paper, speaking with authority in front of people, thinking a job through logically, and getting it done most efficiently. All in all, you have a storehouse of information on doing *best* every job the successful executive must know how to handle.

Library contains these books:

Managing Yourself by Wright . . . The Technique of Getting Things Done by the Lairds . . . How to Develop Your Thinking Ability by Keyes . . . The Technique of Clear Writing by Gunning . . . How to Talk Well by Bender . . . and The Technique of Handling People by the Lairds

SAVE $4.00. Bought one at a time, the total price of these books would be $24.00. Under this special offer, the complete Library is available for only $20.00—a cash saving of $4.00. And you also have the privilege of paying for the books on easy terms, while you use them.

SEE THIS LIBRARY 10 DAYS FREE

McGraw-Hill Book Co., Dept. FL-3-10
327 W. 41st St., N. Y. C. 36

Send me the Library of Practical Executive Techniques for 10 days' examination on approval. In 10 days I will send $4, then $4 monthly until $20 is paid. Otherwise I will return books postpaid.

PRINT
Name .....
Address .....
City ..... Zone .... State .....
Company .....
Position .....

For price and terms outside U. S., write McGraw-Hill Int'l., N. Y. C. **FL 3-10**

Want more information? Use post card on last page.

Weather RADAR sales grow

Corporation plane market expands
$38-million-plus potential exists
Equipment makers vie for future market

A HEALTHY market for commercial airborne weather radar lies in corporation-owned, multiengine planes. Only five to eight percent of the 3,480 planes in this category are flying this equipment. At $12,000 a set, the 3,200 planes without radar form a $38-million-plus market.

Both U. S. and foreign airline markets, though currently good business, will eventually level off. Approximately 500 of the 1,620-plane fleet in the U. S. now have weather radar. However many sets are on order but not delivered and a number of short-run planes will not use the equipment.

Currently available sets must be installed in the nose of the aircraft, which confines them to multiengine planes. This knocks out almost all of the 49,000 private planes as a market and the 19,455 single-engine corporation-owned planes.

Even if installation were possible, few single-engine planes could afford the weight or the cost of present sets. Weight runs over 100 pounds and price from $11,000 to $14,000. Installation adds another $5,000 to $12,000 to the bill depending on the airframe work and rebalancing required.

To move into the lighter twin-engine field three manufacturers are working on lighter equipment. A 50-mile-maximum-range, 50-pound set for $8,000 is scheduled to be marketed in April. Present sets have a 150-mile maximum range.

CD needs taper off

CIVIL-DEFENSE purchases of electronic equipment under the Federal Civil Defense Administration's matching fund program will level off at about $6 million annually, according to a spokesman for the FCDA.

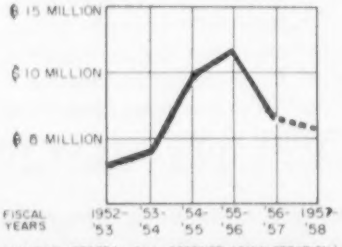
More than $37 million has been invested in electronic equipment since the program began in 1951. About $18.5 million came from federal coffers and the remainder was spent by local governments.

Approximate annual federal expenditures are: $1,750,000 in the 1952-53 fiscal year; $2,250,000, 1953-54; $5 million, 1954-55; $6 million, 1955-56, and $3,500,000, 1956-57.

Most of the funds were spent for communications equipment, including two-way mobile units for police, fire and rescue vehicles, base stations, office monitor receivers, walkie-talkies, radio-alert transmitter receivers for remote areas and Conelrad equipment. Test, maintenance, motion picture, television and tape recording equipment was also purchased.

These demands, however, are expected to tail off.

CIVIL DEFENSE SPENDING



(SOURCE: FEDERAL CIVIL DEFENSE ADMINISTRATION)

TV CAMERA takes a cold dip with skin diver as . . .

ITV market goes underwater

UNDERWATER tv is an application of closed-circuit industrial tv that has so far been pushed largely by the British. Pye Limited has been making and selling cameras fitted for deep water since 1953. An American firm, Hancock Electronics, is now in active competition.

Pye made its first underwater camera at the request of the British government when a jet Comet crashed over the Adriatic. Put together in ten days, the camera searched out 86 percent of the wreckage in 400 feet of water.

Since that time Pye has sold the camera on a world-wide scale in some ten nations. The U. S. Navy has seven in use. Recently much of Pye's business has swung from purchases to rentals.

Hancock has been selling its underwater itv system for a year. Marketed for $4,000 for a complete system, the camera has been selling at the rate of two a month. Hancock also sells the stainless-steel housing alone for $750.

Though the Bureau of Ships and the Fish and Wildlife Service have bought cameras, most of the cameras go to diving and salvage companies. One popular application has been in bridge construction. Some diving firms have put them to work for oil companies in off-shore drilling.

At the recent motorboat show in New York, one boat manufacturer suggested tv for finding fish.

Leesona No. 108 Coil Winders wind coils for the ignition system of the Wright Cyclone Model R-3350 Engine. The system is designed and manufactured by the Scintilla Division of the Bendix Aviation Corporation in Sydney, New York.

At SCINTILLA DIVISION of BENDIX–Leesona® 108's wind Cyclone engine's ignition coils

When Bendix Aviation Corporation designed the ignition system for the Wright Cyclone Model R-3350 engine, they chose Leesona No. 108's to wind the coils.

The job Bendix has assigned to No. 108 Coil Winders is a precision job. The coils they wind are bound for the power plants of high-flying Douglas DC-7's and Lockheed Super-Constellations.

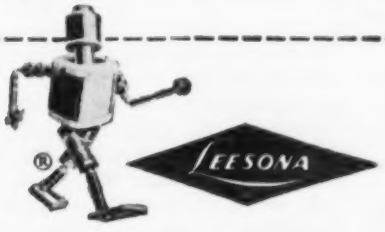
The Leesona 108 Machine is not only a precision winder but an amazingly flexible one. The No. 108 meets the need of a modern hand-feed winder with quick set-up features — where varied lot sizes and short runs are called for. Anywhere from four to thirty paper-insulated coils in stick form can be wound and an operator can make principal adjustments in three minutes with easily operated external controls.

There are no gears, no cams to remove. The 108 Coil Winder reduces set-up time to a minimum.

See for Yourself

. . . how you can make your operations more economical and flexible with the Leesona No. 108 Hand Feed Coil Winder. Send the coupon for details on this and other coil winding machines.

238.4.3



FOR WINDING COILS
IN QUANTITY...
ACCURATELY...USE
LEESONA WINDING MACHINES

UNIVERSAL WINDING COMPANY

P. O. BOX 1605, PROVIDENCE 1, RHODE ISLAND, Dept. 123

Please send me

☐ Bulletin on the Leesona No. 108 Hand-Feed Coil Winders.

☐ Condensed catalog of Leesona Winders.

Name.....Title.....

Company.....

City.....Zone....State.....

SEE US AT BOOTHS 4310-4311 I.R.E. SHOW MARCH 18-21, NEW YORK COLISEUM

Over 400 electronic control circuits

now available for quick, easy reference

Here are the circuits you need for sorting, timing, measuring, and counting; for sweep control, triggering, temperature and motor control, and hundreds of other industrial uses—each with concise description, performance characteristics, component values, and practical applications. Save hours, even days, of search and preliminary work to find basic circuit ideas for a particular application—consult this big, handy collection of tested circuits—selected from recent issues of *Electronics* and classified and indexed for quick use.

Just Out!

Handbook of INDUSTRIAL ELECTRONIC CONTROL CIRCUITS

By John MARKUS and Vin ZELUFF
Electronics Magazine
352 pages, 412 diagrams, $8.75

Following each description is a reference to the original source where you can get more details on related mechanical problems or study graphs of performance characteristics. In the index, each circuit is cross-indexed as many as a dozen times, to permit locating specific circuits quickly when they are known by a variety of names.

a companion volume . . .

Handbook of INDUSTRIAL ELECTRONIC CIRCUITS

By Markus and Zeluff

Contains 433 *different* industrial electronic circuits for immediate practical use. For each circuit there is a clearly-drawn diagram along with a brief yet comprehensive description. 272 pages. 433 diagrams $7.50.

10 DAYS' FREE TRIAL

McGraw-Hill Book Co., Inc. Dept. FL-3-10
327 W. 41st St., N. Y. 36.

Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if you remit with this coupon—same return privilege.)

☐ Markus & Zeluff—Indust. Elect. Control Circ.—$8.75

☐ Markus & Zeluff—Indust. Elect. Circ.—$7.50

(PRINT)

Name .....

Address .....

City .....Zone.....State.....

Company .....

Position .....

For price and terms outside U. S. FL-3-10
McGraw-Hill Book Co., Inc. Dept. FL-3-10

Want more information? Use post card on last page.

NSF reveals R&D figures

First report on industry funds covers full year

Aircraft, electrical equipment topped spending

U. S. supplied 84.4% and 54% respectively

INDUSTRIAL research and development cost $3.664 billion and 20 percent of that—$743 million—went for R & D in the electrical-equipment industry.

This is one of the facts of interest to electronics management revealed by the first of a new series of reports by the National Science Foundation. The report covered 1953.

Of the R & D funds spent in the electrical-equipment industry, $338.6 million was invested by the companies themselves and $404 million by the federal government. Thus the government provided more than 54 percent of that industry's R & D funds.

R & D in the aircraft and aircraft parts industry also accounted for roughly 20 percent of the overall industry total.

However, 84.4 percent of the aircraft industry's R & D funds were provided by the government. This was apparently for the guided-missiles program.

NFS did not make a breakdown of funds for electronics as such, but may try to do so in the future.

The report projected 1954 R & D estimates. These showed a 10-percent increase over 1953 expenditures for the electrical equipment industry and a 20.8-percent rise for the aircraft industry.

In the telecommunications field, 52.2 percent of the R & D funds originated with the government and, in the professional and scientific instruments field, the government percentage was 44.7.

Compared to the 20 percent R & D spending by the electrical equipment and aircraft industries, the chemical and allied industries spent 9.8 percent. Other manufacturing industries, including automakers, spent 16.5 percent.

CARTON ups foreign sales 400%

IN SHIPPING tv tubes overseas, proper packaging can be extremely important. Raytheon feels that using the right cartons last year increased its foreign business 400 percent.

Pallet packing makes possible shipping up to 30 tv picture tubes in one package. The method is not brand new. Corning Glass, Westinghouse, DuMont, Sylvania and others have used it for some time. But, for foreign trade, Raytheon never had.

"We credit pallet packing exclusively for quadrupling our foreign tv tube business," says Dana Robinson, Raytheon executive. "Furthermore, it has saved our overseas customers up to 40 percent on shipping space."

Ocean freight costs are based on cubic volume rather than weight, Robinson points out. The pallet pack eliminates individual packaging, thus saves space and money.

Each pallet pack consists of two cardboard containers, each of which holds 10-15 tubes.

This method is 25¢ per tube cheaper than individual shipping. Thus, a 20-tube pallet saves $5.

Military TWT use rising

TRAVELING-wave-tube amplifiers today are playing an increasingly significant role in military electronics.

Twt amplifiers for electronic countermeasures equipment alone will run into millions of dollars in less than five years. A wide market may also develop for the tubes in missile systems and radar.

So far, many twt's in use are sample development models. These cost $1,000 and up and have been mostly hand built.

Manufacturers see a good civilian market for the devices in navigation aids and anticollision radar. Radar and tropospheric scatter receivers are considered good possibilities.

One firm is offering a commercial low-noise traveling-wave tube. About 100 have been sold since March 1956. At least two other traveling-wave tubes are planned for introduction in 1957.

Developmental twt's range in frequency from 60 mc through the K band. In power-handling ability models range from milliwatts to the megawatt region.

Electronics BOOK titles on rise

BOOKS concerned all or in part with electronics will reach a new high in number of titles in 1957, a survey of five publishers indicates.

A quick check shows a total of 69 titles in the electronics field in 1956. It is likely that this number will rise to well over 80 this year.

Precise figures on electronics books are difficult to obtain because each publishing house has its own book classifications, several of which may contain titles related directly or indirectly to electronics.

The McGraw-Hill Book Co. says the best selling books in the field are those that can be used both as textbooks and as reference works.

RCA INSTRUMENTS OF
LABORATORY PRECISION
Excellent stability characterizes this new vacuum tube voltmeter by RCA
RCA VACUUM TUBE VOLTMETER
Type LV-10, Price $250*
Also ask about Null Voltmeters.

THIS VACUUM TUBE VOLTMETER is extremely versatile, combining in one instrument an AC Voltmeter—covering a range from audio to UHF frequencies, a DC Voltmeter—with 100 megohms input resistance, and an ohmmeter capable of measuring resistance from zero to 1000 megohms. Ideal for use wherever highly precise measurements are essential. Maximum stability and low current consumption are outstanding features. Balanced indicating movement makes this exceptional instrument suitable for use lying flat, standing vertically or inclined.

For complete information on the above and other instruments in the RCA line, write to RCA, Dept. P-46, Building 15-1, Camden, N.J.

*Price in U.S.A., f.o.b. Camden, N.J. Subject to change without notice.

DC VOLTS
7 ranges: 1, 3, 10, 30, 100, 300, 1,000.
Accuracy: ±3% full scale deflection.
Input resistance: 100 megohms ±2% on all ranges.

AC VOLTS
6 ranges: 1, 3, 10, 30, 100, 300.
Sine Wave Accuracy: ±3% full scale deflection.
Input impedance: Less than 2 mmf in parallel with 15 megohms.
Frequency Response: ±1.0 db, 18 cps to 700 MC.
Relative Measurements: possible to 1,000 MC.

RESISTANCE: 0 to 1,000 megohms in 7 ranges.
Accuracy: ±5% between divisions 10 and 100 on scale.
DB Range: —10 to +52 dbm in 6 ranges.
Zero dbm = 1 mw in 600 ohms.

RCA
RADIO CORPORATION OF AMERICA
COMMERCIAL ELECTRONIC PRODUCTS
CAMDEN, N.J.
In Canada: RCA VICTOR Company Ltd., Montreal

Instrument Engineering Representatives in Principal Cities

SAGE spending to continue

Will affect industry many years
1956 expenditures reached peak
Continued growth is foreseen

THE ELECTRONIC Semi-Automatic Ground Environment system for continental air defense will favorably affect the electronics industry for many years to come. Fulfillment of contracts for procurement, installation and testing will require several more years.

New equipment, component replacement and maintenance will continue to be big business as long as the system is used. Operation costs will run to $400 million a year.

Although real estate and construction costs are included in appropriations figures given by Defense Secretary Wilson, the greater portion will go for electronic equipment. $1.086 billion will be spent for capital items. $44 million was expended in 1954. An additional $144 million was obligated in 1955. Fiscal 1956, at $200 million, marks the high to date in annual expenditures.

The Air Force in creating SAGE is using for the first time the weapons system approach to a major ground system. Although SAGE was developed under Air Force contract by MIT's Lincoln Laboratory, Western Electric is the weapons system contractor. The Bell System is main supplier of communications between the various centers.

IBM designed and is building the FSQ-7 computers. These computers are alerted by the radar ring—on land, on Navy picket ships at sea, on offshore Texas Towers, and on airborne early warning planes ranging far out to sea. Radars are linked by telephone lines or ultrahigh-frequency radio directly to the computer.

Information about aircraft within the radar area is relayed continuously and automatically to the computer. The computer calculates for the operator the most effective employment of such defensive weapons as guided missiles, antiaircraft batteries and jet interceptors.

Burroughs is producing analog-digital conversion computers as well as installing and servicing them. Rand Corp. is making digital computers.

Equipment manufactured by a number of other companies is being integrated into the system. Martin's Missile Master, for example, located at key antiaircraft installations, can operate either independently or in conjunction with SAGE.

MILITARY electronics

Missiles too small for telemetering equipment are using small tape recorders to collect aerodynamic data. Developed by North American Instruments, their principal use to date has been obtaining skin temperatures during critical periods in high-speed, high-altitude missile flights.

GE's receiving tube development engineering will center around military ceramic tubes in 1957. Reseach efforts will be concentrated on improving emitters, investigating basic tube materials and improved vacuum techniques. Manufacturing expansion will be noticeable in facilities for producing ceramic types, and in the snow-white factory approach to high reliability.

A 100-percent increase in military electronic expenditures over the next ten years, even with a relatively stable defense budget, is predicted by GE's General Manager of the Defense Electronics Division, George L. Haller.

Sperry plans to double production at its Gainesville, Fla. Electronic Tube division. The added facility to be completed by summer will produce multimillion-watt klystrons for high-power missile-guidance systems.

CONTRACTS awarded

Collins Radio was awarded a $9.9 million Air Force contract for uhf ground communication equipment, including over 1,500 units of the AN/GRC-27 radio set.

Collins has been awarded a $8,523,417 contract by the Air Force for radio receiving and transmitting sets.

DuMont was awarded a $1,400,000 subcontract from IBM to manufacture electronic equipment for use in a navigation and bombing system.

Sylvania will manufacture on a subcontract basis General Precision Lab's AN/APN-81 doppler air navigation systems. GPL, which received a $17 million Air Force con-

tract on December 27, and a $3,030,941 contract on January 11 for the equipment, was requested by the Air Force to award subcontracts in other areas.

Sylvania has been awarded a $1,400,000 contract with the Army Signal Corps to develop and produce four types of magnetrons.

Page Communications Engineers will begin a $15 million classified project in the Western Pacific for the Army Signal Supply Agency.

Page is subcontracting the manufacture of major electronic equipment to RCA.

Siegler's Hallamore Electronics Division in Anaheim, Calif., has received an addition to its contract with Astronautics Division of Convair. Current contract exceeds $3 million and consists of system design and fabrication and assembly of installation equipment used in guided missiles.

Summers Gyroscope has a million-dollar contract from Douglas for Phase II vertical gyro indicator systems to be used in military aircraft. A previous order, of approximately the same volume, was from Grumman.

Convair has a $70.2 million AF contract for F-106A jet interceptors and supporting equipment. The plane's equipment includes an electronic fire-control system which is said to be the most advanced installation developed for an interceptor.

Motorola was awarded a $244,545 contract by Warner Robins Air Materiel Area for modification of approximately 2,520 AN/APS-23 components and plug-ins.

Bogue Electric was awarded a $2.5 million subcontract for production of control systems for long-range missiles.

Amperex was awarded a $554,400 contract by Dayton Air Force Depot for electron tubes, type MIL 4X150-A.

WANTED: A FIX

SERVO CORPORATION OF AMERICA

"Where am I?"
The success of the mission, the safety of both pilot and plane depend upon the correct answer to this question.

Supplying that answer instantaneously is the vital function of automatic ground-based radio direction finding and airborne navigation systems.

The newest multi-engined radar picket planes are guided with a course continuously plotted by automatic, airborne navigation systems designed and manufactured by Servo Corporation of America. Radio direction finding systems produced by Servo Corporation of America range from compact, mobile systems to permanent, remote-controlled direction finding stations.

Information on Servo Corporation of America's automatic radio direction finding systems, and automatic navigation systems is available to you. Simply request, on your company letterhead, RB-9906-56A.

McGRAW-HILL TECHNICAL WRITING SERVICE

TWS offers you a single INTEGRATED publishing service prepared to undertake a project from research and planning through finished manuscript and art, typesetting, mechanical preparation, printing and binding. Whatever the situation, whatever the type of literature you need, our editorial and art consultants can help you, bringing to your most specialized job the craft and skill of publishing experts.

WRITING EDITING ILLUSTRATING PRINTING

TO YOUR OWN OR GOVERNMENT SPECIFICATIONS

Whether you need an instruction book or service manual, to accompany your equipment, written to government specifications . . . . . or product catalogues or training booklets . . . or annual reports . . . or company histories . . . our writing staff can do the job for you, our artists can create and execute the illustrations. And McGraw-Hill printing, binding, and paper resources are among the best in the country.

SAVE MONEY AND TIME

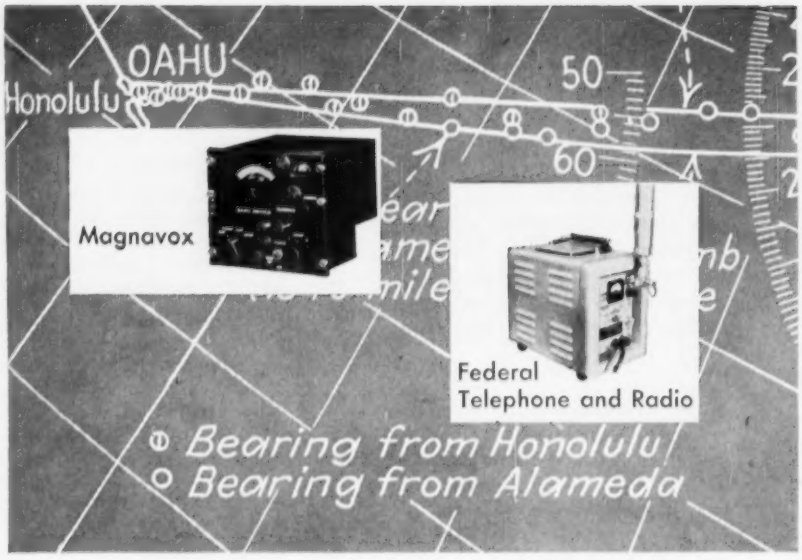
LET OUR STAFF BE YOUR STAFF FOR TECHNICAL and BUSINESS PUBLICATIONS

ASK OUR REPRESENTATIVE TO CALL

Write • Phone

Technical Writing Service
McGraw-Hill Book Co., Inc.
330 W. 42nd St., N. Y. 36, N. Y.
LOngacre 4-3000

New Products guide



AIR navigation in the jet age will be easier with new adf and TACAN

TO DETERMINE where they are and where they're going, new position and navigation equipment is offered for aircraft and missiles. An automatic direction finder designed by **Magnavox** (P1) for use in aircraft weighs less than 30 lbs. Rapid in-plane testing of TACAN navigation equipment is said to be possible with a test set announced by **Federal Telephone and Radio** (P2).

Minneapolis-Honeywell's (P3) floating gyroscope for short-time guidance systems weighs only 8 ounces. Remote caging and uncaging is possible with the solenoid-operated caging system in **Humphrey's** (P4) free gyro for missile systems. Accelerations of aircraft and missiles in two mutually perpendicular planes are measured by an accelerometer produced by **Genisco** (P5).

A stabilizing amplifier for color and monochrome tv stations has been announced by **RCA** (P6) to reduce such low-frequency disturbances as hum, bounce, surge and tilt. . . . **Curtiss-Wright** (P7) announces a bistable thermal time-delay relay with single-pole double-throw contacts.

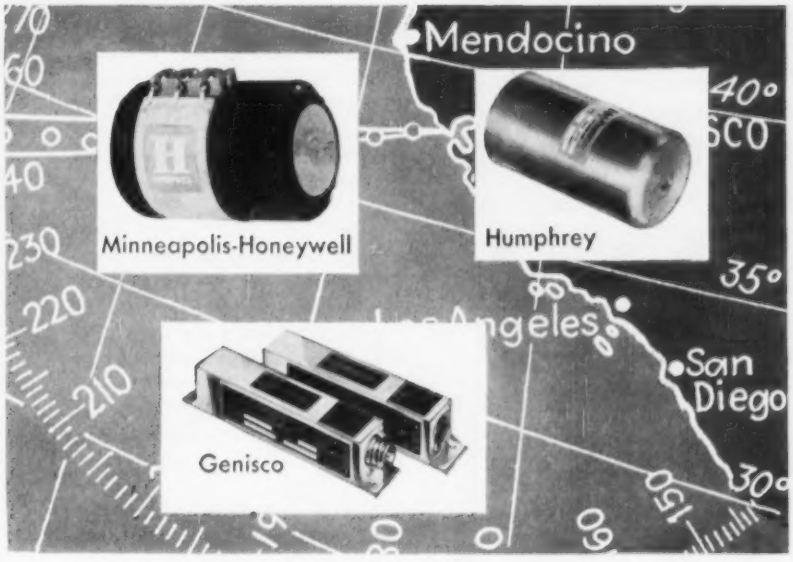
Microwave components made of oxygen-free copper by **Airtron** (P8) are said to minimize losses in long transmission lines. . . . **Dynalysis** (P9) announces a 3-channel converter to change 400-cps transducer signals to d-c voltages for telemetering inputs.

The Model M-510 pulse amplifier offered by **Instruments for Industry** (P10) has a bandpass of 200 kc to 220 mc and a gain of 19 db. . . . Covering the resistance range of 0.1 to 25,000 ohms, a ⅛-watt resistor offered by **General Resistance** (P11) is ⅛ inch in diameter and ⅜ inch long.

Speed reducer kits for laboratory and breadboard use in electronics are available from **Pic Design** (P12)

For more information circle numbers in SECTION B, READER SERVICE CARD (facing p 48)

planes, missiles



equipment. Small gyroscopes and accelerometers are useful in missiles

with 1¾- or 1⅞-inch outside diameters. . . . Available from **Tect, Inc.** (P13), Vythene-E is said to be an excellent cleaner for precious-metal contacts in electronic equipment.

Low-power decade counting units announced by **Computer-Measurements** (P14) are said to operate beyond 100 kc. . . . Six separate timing sequence operations can be handled simultaneously by **Avionic's** (P15) sequence timer for automation applications.

RCA's (P16) type 5636 sharp cutoff pentode is intended for gated amplifier circuits, delay circuits and mixer circuits at frequencies up to 400 mc. . . . A series of readout counters announced by **Veeder-Root** (P17) provide electrical contacts for each reading to supply data for remote indication, remote printing or logging or direct card or tape punching.

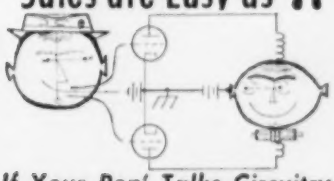
Mantec's (P18) 5-cu ft environmental test chambers are said to drop temperature from room level to −65 F in 5 minutes and raise it to 400 F in ten minutes. . . . Differentials with oilless bearings are announced by **Pic Design** (P19) for analog computers.

RCA (P20) announces the type 2N270 alloy-junction transistor for such large-signal audio applications as single-ended or double-ended output stages or high-gain class A driver stages. . . . A rotating-drum events recorder available from **Gorrell & Gorrell** (P21) uses an inkless stylus to remove a layer of wax crystals covering a contrasting color on the chart.

Performance Measurements (P22) announces a digital indicator for use with variables such as temperature, pressure and flow that can be converted to electrical quantities. . . . Beryllium-copper strip said to be completely free of surface oxides is announced by **American Silver** (P23) for current-carrying springs and other electronics applications.

Designed for panel mounting, **Trio Laboratories'** (P24) vtvm is said to have an accuracy of 2 percent. . . . **Raytheon's** (P25) diffused-junction silicon rectifiers are available in a ⅞-inch stud-mounted

Sales are Easy as π



If Your Rep' Talks Circuitry

Your company's sales may be increased by the applications engineers of the Sodaro Company. Every Sodaro man in the field is able to give direct help to the engineers who may specify your products, for Sodaro sales representatives are all senior electrical engineers previously in design work. Welcomed for their applications knowledge, their inside engineering contacts give them a broad awareness of most projects promising potential sales. Their frequent contact and constant helpfulness puts your product in a position of advantage when orders are placed.

Our recent growth in field representation puts us in a position to consider one more manufacturing client. If your company would be interested in learning of some of the substantial sales increases our clients have enjoyed please write or call:

SODARO CO.
LOS ANGELES — Culver Hotel Bldg., Culver City, Calif.
SAN FRANCISCO — Telephone: TExas 0 3213

Representing: FORD INSTRUMENT CO. (DIV. OF SPERRY RAND CORP.) • CURTISS-WRIGHT CORP. ELECTRONICS DIV. • CUBIC CORP. • TRAD ELECTRONICS CORP.

FOR MANUFACTURERS OF TELEVISION TUBES

A NEW PRODUCT

POTASSIUM SILICATE POWDER

for easy dissolving and use in your own plant. No special equipment required.

DR. F. JONAS CO.
55 West 42 St.
New York 36, N.Y.
Telephone: LOngacre 3-0791

Want more information? Use post card on last page.

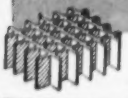
For manufacturers of Radio, Electrical and Electronic components and allied products!

Pre-assembled ...custom-made

PARTITIONS

for Protective Packaging

made to your exact specifications for faster packing at lower cost!



WRITE, PHONE or WIRE for QUOTATIONS on YOUR REQUIREMENTS

PETER PARTITION CORP. operates one of the *largest plants* in America devoted *exclusively* to the production of cardboard partitions. Because of our *unexcelled facilities*, our customers know we are equipped to fill orders FAST, ON TIME, and AS SPECIFIED—*at a price that's always right!*

PETER PARTITION CORP.

Manufacturers of Cardboard Partitions

124 BOERUM PLACE BROOKLYN 1, N.Y.

Telephone: TRiangle 5-4033

DO YOU KNOW . . . .

How and when the growing demand for transistors, diodes, and other solid-state devices will affect your future planning?

Whether you make or use electronic devices, the future success of your operation can depend upon your ability to anticipate the market trend toward replacement of conventional components by solid-state devices.

Our twelve years of marketing consulting experience in the electronics industry, combined with our long established contacts, provide you with the means of obtaining constructive answers to this question.

Call or write us for an explanation of our services.

HOLLENBECK AND COMPANY

Suite 2806

420 Lexington Avenue New York 17, New York Lexington 2-4907

McGraw-Hill Mailing Lists Will Help You for Results

- Merchandise your advertising
- Conduct surveys
- Get inquiries and leads for your salesmen
- Pin-point geographical or functional groups
- Sell Direct
- Build up weak territories
- Aid Dealer relations

Mc GRAW-HILL DIRECT MAIL LIST SERVICE

Direct Mail is a necessary supplement to a well rounded Business Paper advertising program. Most progressive companies allocate a portion of their ad budgets to this second medium at the same time as they concentrate on the best business publications. 600,000 of the top buying influences in the fields covered by the McGraw-Hill publications make up our 150 mailing lists. Pick Your prospects out of our Industrial Direct Mail catalogue.

Write for your free copy of our Industrial Direct Mail catalogue with complete information.

case and have a forward current rating of 1 ampere at 150 C.

Brighter phosphor blends for tv picture tubes are announced by **Du Pont** (P26). . . . **Dynamic Instrumentation's** (P27) d-c gating system is a single-pole double-throw switch that is said to be capable of transition in substantially less than 10 microseconds for multiplexing d-c signals.

Two half-wave mercury-vapor rectifier tubes (types 6894 and 6895) announced by **RCA** (P28) are intended for use in broadcast transmitters and industrial equipment. . . . A vtvm announced by **General Radio** (P29) for production line and laboratory use is said to have an accuracy better than 2 percent.

Electro Instruments (P30) announces a portable digital voltmeter which measures up to 999.9 volts d-c. Hermetically sealed armature type relays for switching radar pulse-forming networks have been developed by **Bomac Laboratories** (P31).

Electrical contact materials available from **American Silver** (P32) in clad strip, button and disk forms have a thin contact surface of precious metal bonded to an inexpensive base metal to reduce costs. . . . A goniometer has been announced by **Electro-Mec Laboratory** (P33) for measuring and adjusting the shaft angle of precision components.

National's (P34) line of high-Q ferrite-core chokes are available with inductances ranging from 150 microhenrys to 1 millihenry for use in networks and filters at frequencies from 50 to 1,500 kc. . . . Relays for d-c applications announced by **General Automatic** (P35) operate as fast as 2 milliseconds and are available with resistances from 0.01 to 30,000 ohms.

A high-speed microwave cavity solenoid announced by **Naylor** (P36) has a stainless-steel probe pin which travels about 0.032 inch to detune the cavity. . . . Wire-

wound 2-watt precision potentiometers offered by **Maurey Instrument** (P37) have been designed for rugged service.

Precision gear boxes for instrument, servo and computer applications are offered by **Southwestern Industries** (P38) with ratios up to 12,000:1. . . . **Helipot** (P39) announces miniature differentials to be used in electromechanical breadboard setups. . . . Called the Rotostepper, a pulse to analog converter developed by **Giannini** (P40) provides 2-degree shaft rotation for each pulse.

Sage Electronics' (P41) miniature metal-clad chassis-mounted precision resistors, at nominal power ratings of 25 and 50 watts are said to dissipate heat more efficiently. . . . Milling of germanium, silicon and quartz for electronic components is said to be possible with milling machines produced by **U. S. Burke Machine Tool** (P42).

Kintel (P43) announces operational broadband d-c amplifiers for analog computers which are said to have an open-loop d-c gain greater than 140 db. . . . Spectrometers announced by **Mount Soprio Instrument** (P44) for alpha, beta or gamma spectrometry can be used as differential or integral spectrum scanners, photopeak counters or wide energy band counters.

A readout tube announced by **Burroughs** (P45) converts electronic signals directly to readable characters. . . . Individually insulated press-fit test-point jacks are available from **Scalectro** (P46) for mounting in metal sheeting. . . . Light weight and small size are featured in a 13-channel electrical programmer announced by **Photographic Products** (P47) for aircraft and missile work.

Offner Electronics' (P48) 8-channel oscillograph provides for rapid change from ink or electric-sensitive paper for curvilinear recording to heat-sensitive paper for rectilinear recording. . . . A subcarrier oscillator announced by **Hoover Electronics** (P49) for f-m/f-m telemetering systems converts trans-

GYROS
for every application

For hours in aircraft or minutes in missiles, gyros must possess ruggedness and dependability that will assure performance of the mission. Kearfott Gyros possess this ruggedness and dependability coupled with extremely high accuracy. That is why they are so widely used in all types of aircraft and missiles. Kearfott Vertical, Rate, Free, Directional and Floated Rate Integrating Gyros as well as Stable Elements are designed to meet the most stringent airborne requirements.

Unsurpassed in Performance Unequalled in Compactness

Kearfott Miniature Vertical Gyros satisfy the requirements of MIL-E-5272 as regards shock test (Procedure II) humidity, salt spray, fungus resistance, rain, sand, dust, immersion and explosion proof. Duplicates the performance of standard vertical gyros in ½ the volume and weight.

Write today for technical data on Kearfott Gyros.

KEARFOTT COMPONENTS INCLUDE:
Gyros, Servo Motors, Synchros, Servo and Magnetic Amplifiers, Tachometer Generators, Hermetic Rotary Seals, Aircraft Navigational Systems, and other high accuracy mechanical, electrical and electronic components.

Kearfott

A SUBSIDIARY OF GPE

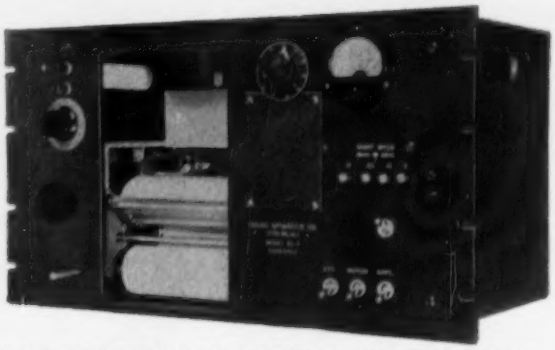
KEARFOTT COMPANY, INC., LITTLE FALLS, N. J.

Sales and Engineering Offices: 1378 Main Avenue, Clifton, N. J.
Midwest Office: 188 W. Randolph Street, Chicago, Ill. South Central Office: 6115 Denton Drive, Dallas, Texas
West Coast Office: 253 N. Vinedo Avenue, Pasadena, Calif.

FREQUENCY RESPONSE RECORDER

MODEL
SL-4

4" Chart width
•
Ink recording



A COMPACT, STURDY LABORATORY INSTRUMENT
***incorporating our* PATENTED SLIDING COIL RECORDING UNIT.**
This recorder can easily be coupled to oscillators, sound, vibration, wave and noise analyzers for convenient recording of electro-acoustical measurements.
Featuring ELECTRONICALLY CONTROLLED FAST AND SLOW PEN SPEED; LEVER SELECTION OF 3 DIFFERENT CHART SPEEDS.

- **Rack-mounting**
- **Rugged construction**
- **Minimum servicing**

Model SL-4 can be supplied for ac, or ac-dc signal recording.

Bulletin sent upon request

SOUND APPARATUS COMPANY, STIRLING, N. J.
Designers and Manufacturers of Graphic Recorders
***Southern Representative:* RICH ELECTRONICS, INC., 212 N.W. 8th Ave., Miami, Fla.**

A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet."

McGraw-Hill Publishing Company, Room 2710, 330 West 42nd St., New York 36, N. Y.

ducer output to an equivalent subcarrier frequency shift.

The phase angle between two a-c voltages is presented directly in degrees on a series of phase meters available from **Advance Electronics** (P50). . . . Twelve ranges between 0.001 and 300 volts a-c can be measured with a portable transistorized voltmeter announced by **Fisher Research Laboratory** (P51).

Bell Fuse (P52) announces delay lines providing delays from 0.02 microsecond to 2 microseconds for use in color tv sets, computers and fire-control systems. . . . For lower frequency radar and scatter communications systems, **I-T-E Circuit Breaker's** (P53) size WR-2100 slotted line features a vswr of less than 1.02.

Battery operated highway hazard flashers announced by **R. E. Dietz** (P54) are transistorized. . . . Designed for laboratory and industrial applications, a decimal counter announced by **Victor Adding Machine** (P55) may be used for servo and digital position control and frequency deviation measurement.

Torque-limiting devices announced by **Radial Metal Products** (P56) are produced with magnetic, spring-beam and multiple-disk clutches. . . . Tube sockets announced by **Radio Frequency** (P57) have been especially designed for high-power high-frequency tubes such as the 3X250-A and F3 and the 3X3000-A1 and F1.

Peschel Electronics' (P58) overpotential test set for insulation testing supplies 100 kilovolts output. . . . Totalizing counters announced by **Computer Measurements** (P59) can be used for totalizing such production units as cans, bottles, penpoints and pills. . . . **Intersearch** (P60) is offering a Japanese-made capacitor microphone said to have a frequency response of 20 to 18,000 cps plus or minus 2 db.

Slotted lines and a universal carriage are offered by **Diamond Antenna and Microwave** (P61) for standing-wave measurements between 1,700 and 5,850 mc.

A-M's go AUTOMATIC, but slowly

About 150 have equipment
No manpower savings for some
Satellite tv using tape control

TAPE-PROGRAMMED operation of a-m broadcasting stations is catching on, slowly. Equipment has been on the market for two years that will control the ons and offs of program fare all the broadcasting day. Using tape with subaudible tones, the control equipment can key programs automatically.

Manufacturers of automatic control equipment have found the broadcasting market slow. A survey by Ampex indicates that only 150 out of the over 3,000 a-m stations have bought.

A large swatch of stations sees no advantage in putting their operation on a robot schedule. One licensed operator is still required by the FCC regulations. Many a-m stations are already down to one-man operation.

Some broadcasters have ascribed slowness in going automatic to fear of losing station personality. The term "juke box" operation has been tossed about in some quarters.

Nevertheless, some a-m stations have found tape-programmed operation just their cup of tea.

- At KEAR, San Francisco, two automatic tape machines are used, both having material for eight hours of continuous transmission.

- WJET, Erie, Pa., programs automatically from 6:30 p-m until 2 a-m. The station has one operator on duty. Sunday's entire schedule is automatic.

- KSON, San Diego, uses two automatic program systems, one for a-m and one for f-m. The station claims this equipment saves the services of ten people.

Television is also going automatic. Manual program control can be reduced to punch tape or card.

Station WSYE-TV, Elmira, New York has installed an automatic program control system. Operating as a "satellite," WYSE-TV, carries almost in its entirety, the programming of "mother" station WSYR-TV, Syracuse.

TELE-education gets test

SINCE September an experiment has been carried on in Washington County, Md. that has long-range importance to closed-circuit tv makers.

Sponsored by RETMA with equipment and money from more than 40 manufacturers and by the Fund for the Advancement of Education ($95,000 grant), educational closed-circuit tv has been going at a fast pace. 4,000 pupils in eight schools are involved.

Alexander Stoddard, retired Los Angeles Superintendent of Schools, sees tv as substituting for 50,000 teachers and saving $1½ billion.

Fund for the Advancement of Education has sunk $1,248,000 in the past several years into grants for tele-education installations. In addition, more than 70 colleges are using closed-circuit tv.

FCC actions

Senate Commerce Committee, carrying on its long established concern over FCC actions, wants more tv stations established. It wants FCC explanations on what is being done to make more stations possible.

Robert F. Neathery was granted a c-p for a new a-m station at Willow Springs, Missouri.

Lockport Union Sun got a c-p for a f-m station at Lockport, N. Y.

Putting off consideration of changing present multiple ownership rules was urged upon the Commission by its network study staff. The group wants to complete its final report first. The report is expected by June 30.

Estimates on people within the range of a tv signal were given by the commission. Ninety percent of the population is reached by at least one tv station; 76 percent can get two stations; 60 percent, three.

Tv construction permits were granted to Kaiser Hawaiian Village Television for channel 13 in Honolulu, Hawaii; to Plaza Radio & TV for channel 26 in San Francisco, Calif.; to The Heart of the Black Hills Stations for channel 7 in Rapid City, S. Dak.; and to Midcontinent Broadcasting for channel 6 in Reliance, S. Dak.

Any size, or type, or
quantity . . . your requirements
for precision reels,
in military, industrial or
commercial applications,
off the shelf or custom designed
will be met by our wide range of
pre-engineered hubs
and flanges . . . or by
a custom design. Apply our
long, specialized
background to your
problem . . . Write today.
STANDARD RECORD
manufacturing company . . . since 1939
70 N. San Gabriel Blvd., Pasadena, California

41 electronics manufacturers open new plants in Puerto Rico

WANT TO KNOW WHY?

NEW 75-PAGE BOOKLET—FREE TO MANUFACTURERS

Commonwealth of Puerto Rico, Dept. EM-73
Economic Development Administration
579 Fifth Ave., New York 17, N. Y.

Send me "Facts for the Manufacturer" with information about my particular industry.

Name_____ **Title**_____

Company_____

Address_____

Product_____

STATION moves and plans

KYMA, Yuma, Arizona, has changed its call letters to KVOY.

KBKI, Alice, Texas, along with a management switch has changed its call letters to KOPY.

KRCA, Hollywood, Calif., begins a regular schedule of colorcasting. The NBC owned and operated station combined the move with celebration of its eighth anniversary.

WOV, New York, entering its 30th year of broadcasting, is expanding its facilities. It is also installing a new 10-kilowatt transmitter.

KEAR, San Francisco, expects to expand its f-m coverage. It wants to change its transmitter site and boost its power to 125,000 watts.

WBSM, New Bedford, Mass., has raised its power from 100 watts to 1,000 watts.

KWBU has changed its call letters to KATR.

NBC owned and operated station in Hartford, Conn. is no longer WKNB-TV. Its name is now officially WNBC. The latter title had formerly belonged to the network's New York station which is now WRCA.

KALI, Pasadena, Calif., was sold to H. Scott Killgore and associates by Henry Fritzen for $302,536.

KWBE, Beatrice, Neb. was sold by Blue Valley Broadcasting to Gordon C. Pentz and William R. Boyce for $96,250.

WTVT, Tampa, Fla., is doubling the size of the station's facilities.

Tower increases were made by WDSU-TV, New Orleans, La. and WFRV-TV, Green Bay, Wisc.: 972 feet and 999 feet respectively.

WGIR, Manchester, N. H., becomes new CBS Radio affiliate.

RESEARCH pays off in cash

New England plants up production
Civilian supplants military business
New products are one reason

LATEST SURVEY of New England's electronics industry reports sales up from $582 to $612 million over a three-year period (1953-1955).

Growth went on despite a 19-percent decline in government contracts.

The survey, conducted by the Federal Reserve Bank of Boston, indicates a stronger trend towards civilian electronics business. Boston plants' sales based on government work fell from 60 to 54 percent. Outside of Boston, the proportion tumbled from 37 to 19 percent.

Between 1950 and 1954, research expenditures soared 64 percent, from $26 million to $42.6 million. The number of firms with research and development programs expanded by more than 50 percent. In 1950, only 51 of 123 companies had R & D programs. By 1954, 78 firms had them.

In 1955 over half of all electronics employees in New England worked on products developed by research within the previous five years. Eighty-six manufacturers reported 28,000 persons, 56 percent of their employees, working on new products.

Between 1950 and 1954, research expenditures soared 64 percent, industry upped plant space about 23 percent. Wages paid by Boston firms increased 6 percent to about $127 million. The rest of New England did even better. The $94 million paid out to employees represented a 15 percent boost.

Opportunity is still at New England's electronics door.

Private STANDARDS labs increasing

RAPID GROWTH in the number of private standardizing laboratories being established by manufacturing plants, universities and government agencies can be attributed to increased production, greater product complexity and higher accuracy required in the end result.

Plants without private standardizing facilities send test gear to commercial laboratories or the National Bureau of Standards in Washington for calibration.

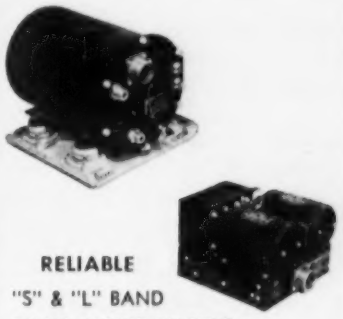
Although the cost of setting up a private standardizing laboratory is prohibitive for some concerns, it pays off for others. The break-even point occurs when the cost of sending equipment out for calibration will pay for a company's own facilities. Reaching this point depends on the volume and complexity of calibration problems in the test gear involved.

Another reason for establishing a factory-based laboratory is to eliminate the problem of transporting delicate equipment to out-of-town test centers.

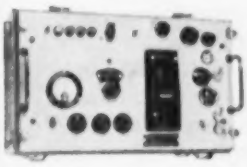
Cost of setting up a standardizing laboratory depends on variety of equipment to be calibrated and accuracy required. A laboratory demanding 0.1-percent accuracy may be established for less than $25,000. Equipment for Sandia Laboratory's physical and electrical standards lab cost more than $\frac{1}{2}$ million. The lab is operated by a technical staff of forty.

Telerad MANUFACTURING CORPORATION

SPECIAL PRODUCTS



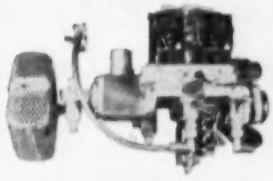
RELIABLE
"S" & "L" BAND
GUIDED MISSILE BEACONS



TEST SET
TSG-147D

TELE-FLEX
FLEXIBLE WAVEGUIDE

TELE-GUIDE
RIGID WAVEGUIDE & COAXIAL COMPONENTS



Telerad MFG. CORP.
GENERAL OFFICES
1440 BROADWAY · NEW YORK, N. Y.
BRYANT 9-0893

Visit Us at Booth 3241—I.R.E. Show
Want more information? Use post card on last page.

STRAIN-GAGE sales climb

Much electronic gear used with gages
Aircraft industry is large consumer
Other industrial applications grow

STRAIN GAGES, about the size of a postage stamp, are big business. Some $6 to $7 million is spent annually for strain gages and strain-gage transducers.

The typical strain gage comprises a thin wire about 1/1,000 inch in diameter sandwiched between two thin pieces of paper or similar material. When the wire is stretched or compressed, its resistance changes. If a voltage is applied across the gage or if it is used in a bridge circuit, an electrical indication proportional to the change in length can be obtained.

The electrical signal can be presented on an oscilloscope or recorded. By selecting appropriate scales, strain-gage outputs can be related to physical quantities, such as weight, pressure and torque.

Production of one type of strain gage has increased from about 10,000 a month in 1946 to 80,000 a month in 1956. Electronic equipment associated with strain gages ranges from relatively simple amplifiers and indicators to elaborate data-handling and telemetering systems.

Probably $20 million is spent on associated electronic apparatus, although an accurate estimate is difficult to arrive at. For example, strain gages may be used in a system to monitor stress on the blades of a helicopter. The recording instruments used in the system may be used at a future time in an entirely different application.

Although strain gages are often expendable, they are used in permanent setups in many industries. The food, paint and chemical industries use load cells, strain gage transducers that measure weight, to mix quantities according to weight. Minute changes in the weight of patients in hospital beds are also measured with load cells.

Torque and horsepower can be determined by coupling a strain-gage transducer between the driving force and the load. Measuring the thrust of jet engines and calibrating torque wrenches are applications.

Industry fights TAPE RECORDER tax

SOMETIME around the end of this month, the House Ways and Means Committee will be deliberating on its Excise Tax subcommittee's report recommending that tape recorders should be subject to a 10-percent manufacturers' excise tax.

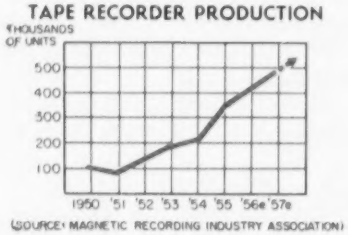
The recommendation, reported to the full committee in January, would levy the tax on all radio, tv, phonographs, and tape and wire recorders. The only exemptions: navigation, detection and communications equipment.

Previously, radio, tv and phonographs "of the entertainment type" were taxed. Now tape and wire recorders are to be included, and the knotty problem of defining "entertainment type" disappears.

The magnetic recording industry, which this year expects to sell half a million tape recorders for an estimated gross of over $90 million, raises strong objections to the proposed new tax. Home market for recorders is "small and unprofitable" says Pentron president Irving Hoffman.

According to the Magnetic Recording Industry Association, there are about 65 recorder makers in the industry, ¾ of them with fewer than 100 employees. Most are young and struggling: average company age is 7 years. Best part of the market is in the hands of about 35 manufacturers. Of these, about two dozen are major producers in the mass less-than-$300 market, which accounts for 83 percent of unit sales.

Fourteen percent of unit sales are in the $300-600 bracket, and the rest is about evenly split between the $600-1,000 and over-$1,000 brackets. Fifteen major producers probe this more-than-$300 market, including six who also market cheaper sets.

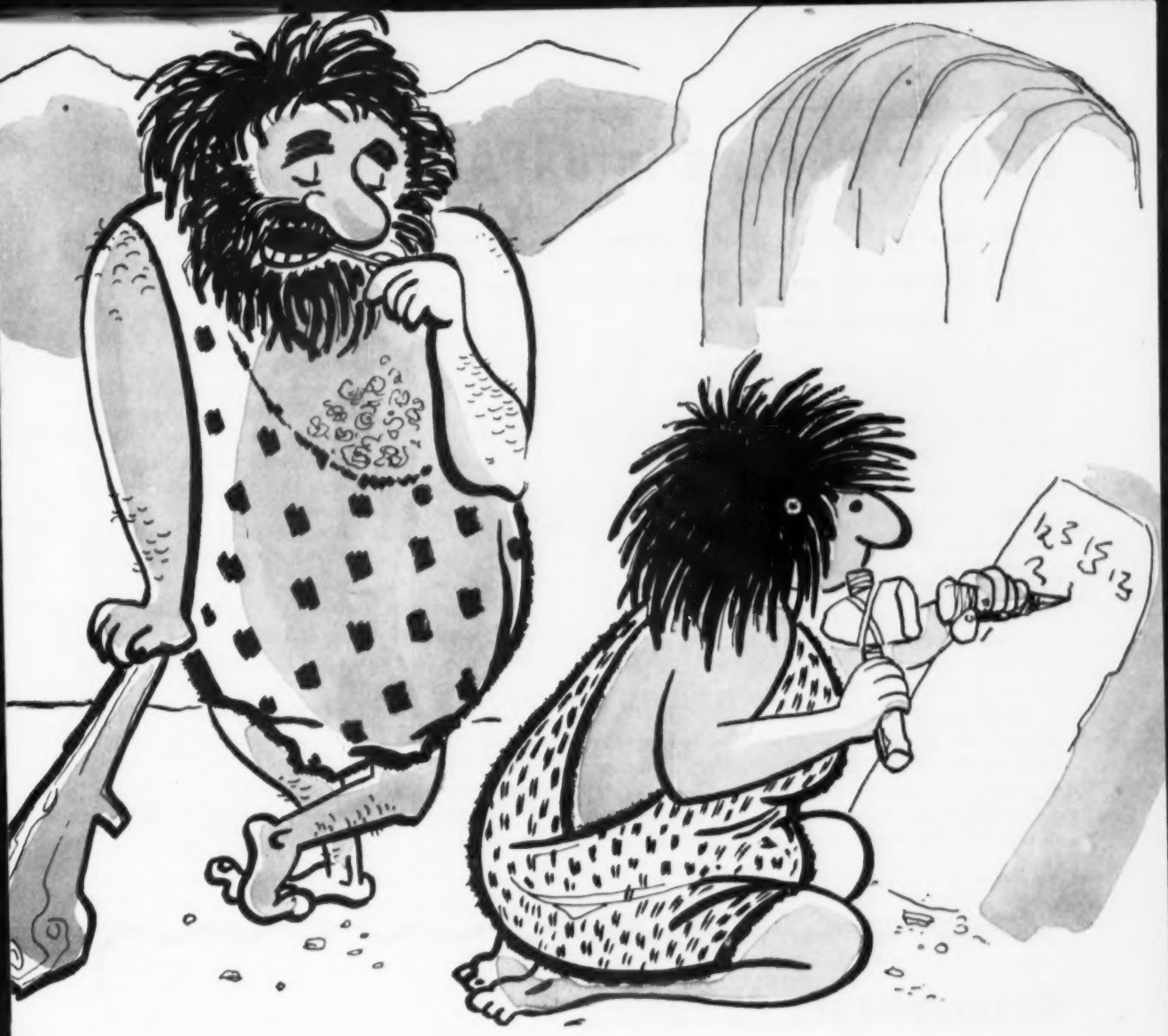


TAPE RECORDER sales: will new tax level off the upsurge?

Industry estimates that about 65 percent of total dollar volume comes from sales to laboratories and schools for scientific or educational purposes, to broadcasters and other professional users, and to government. A substantial part of this volume is from sales of specially designed recorders.

Home recorders are used in speech therapy, psychiatric examination, religious and industrial training, and for recording books and other material for the blind as well as for entertainment. Over two million recorders are now in use. Excluding bulk sales for industrial uses, makers of recording tape now estimate that they sold in '56 some 6 million reels for a gross of close to $20 million.

Prerecorded tapes are sold by a dozen-odd producers of stereophonic recordings and half a hundred monaural-record makers. These hi-fi tapes, selling for $8-10 a reel and up, will bring in about $600,000 in 1957 (compared to the $225-million disk business).



"This refers to yours of the 10th..."

Some people still hammer out communications one character at a time.

Others use DATAFAX—the fast Stewart-Warner electronic way to transmit all data over standard telephone lines.

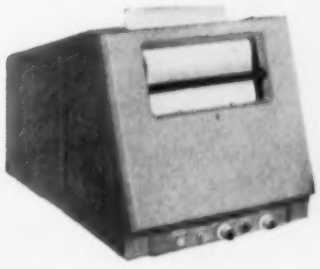
Datafax transmits and records any material: correspondence, drawings, pictures, printed matter, even handwritten notes. And since copies are exact duplicate images of the original, chance for error is eliminated.

Cost?

Automatic transmission and recording eliminate need for full-time operator; recorders will even respond to transmissions sent after the office is closed for the day. Datafax also eliminates retyping, proofreading, intermediate handling, intransit delays—and their clerical costs. The clear, smudge-proof, permanent Datafax copy costs less than 2¢ for a letter-sized unit, plus pro rata line charge.

Chances are your accounting...inventory control...engineering...production...branch sales...and warehouse operations have outgrown Stone Age Communications. If so, you'll want to find out about Datafax.

First, send for your copy of the free Datafax bulletin. Write: Stewart-Warner Electronics, Dept. 21, 1300 No. Kostner Ave., Chicago 51, Illinois.



STEWART SW WARNER **ELECTRONICS**

a Division of Stewart-Warner Corporation

Industry booms in JAPAN

See 1957 output $346.3 million
Industry has yen to lift exports
Government yen to help

JAPANESE electronics production has been increasing sharply since 1954, and the 1957 prospect is for production of $346.3 million worth of electronic products.

The 1956 output was estimated at $288 million compared with $241 million the year before, or a 20-percent rise. This year, the industry expects another 20-percent increase.

Exports have risen from $6.1 million in 1955 to about $9.1 million in 1956. With sales of transistorized products, radio and tv transmitters and parts and microwave relay equipment to Southeast Asia and other areas, exports are likely to reach $12.2 million in 1957.

Technological advancement thus far has outstripped the economic ability of the industry to make use of new developments. However, a number of new products are being turned out. One example is the parametron, which greatly reduces the number of electron tubes required in a computer.

The industry is placing much emphasis on transistor radios and phonographs. Much attention is being given the development and possible uses of traveling-wave tubes. New kinds of measuring instruments are being produced, along with weather observation and telephone equipment.

About $800,000 worth of test equipment will be imported from the U.S. in 1957 and the normal 15-percent duty is being dropped. This and Japanese-made test equipment will be used by government and industry to test items in accordance with U.S. military specifications.

The government also wants to extend its inspection powers to maintain high quality in selected export items.

Low expendable income limits the domestic market. Because of this and other economic factors some firms copy other products rather than invest in their own designs.

The government hopes to overcome major problems through increased loans. In 1956 government loans totaled $1.4 million out of a $9.4-million investment in electronics. More than $44 million is slated for investment by the government over the next four years.

Developments ABROAD

London's Metropolitan Police have ordered 50 mobile vhf radiotelephones from Marconi's Wireless Telegraph Co. The transmitter-receivers are of the 10-watt f-m variety and provide up to seven channels.

Netherlands claims the largest civil radar net in the world for its New Waterway, a canal running from Rotterdam to the North Sea. The net includes seven radar installations which cost $1.5 million.

In England Epsilon Research and Development, Ltd. says it will produce a small fast-operating tape transport for digital data processing systems. First production model is expected midyear and a U.S. appearance not long after that.

In England Marconi is producing new type of 16-mm television recording equipment. It is said to incorporate a fast pull-down mechanism that marks a significant advance in the production of high-quality film recordings from standard tv signals. Customers include the BBC, the German tv authority, Bayerischer Rundfunk, and the Australian tv station, ATN.

In Italy a newly formed private company is reportedly negotiating for the purchase of tv equipment with U.S., German and Swiss manufacturers. The company, Centro Milanese Cinetelevisivo, is challenging the Italian government's television broadcasting monopoly.

The group, which says it has $10 million in backing from industrial groups in northern Italy, hopes to set up soon an experimental station in the Republic of San Marino, which is not subject to Italian law.

In Japan Tokyo Shibaura Electric Co. has produced experimentally artificial 3-inch mica crystals for use in electron tubes and other equipment subjected to high temperatures. The company claims the crystals can endure temperatures of more than 1,000 C.

Canada's RETMA will hold its 28th annual meeting June 20-21 at the Chantecler Hotel, Ste. Adele en Haut, Quebec. More than 100 firms, which manufacture $500-million worth of electronic goods a year, hold membership in the association.

EXPORTS and IMPORTS

In London electronic computing equipment and accounting aids will have the largest of 20 sections at Britain's Business Efficiency Exhibition to be held June 17-27. Visitors from more than 50 countries are expected to attend. Computers capable of doing all types of office calculation will be shown.

In Brussels an analog computation center will be opened this summer by Electronic Associates of Long Branch, N. J. The equipment and staff will be available on an hourly, weekly or monthly rental basis to companies in Western Europe. Direct sales will be made also from the center.

The company, which has computation centers in Princeton, N.J. and Los Angeles, has sold precision analog computers in Sweden, France and Italy.

Israel's Weizmann Institute of Science has purchased a high-speed memory unit for its electronic digital computer from Telemeter Magnetics of Los Angeles. The computer is capable of storing 4,096 numbers, each consisting of 40 binary digits. Any of the numbers can be fed into the memory from the computer, or read out of the memory into the computer in 10 microseconds.

In Tokyo the Japan Wireless Co. announces it is selling a radar storm detector to India for installation at Calcutta's International Airport. The set, especially designed to pick up and track Japan's typhoons, has been effective in tests at meteorological institutes in Tokyo and Osaka. It is equipped with range-height finders to measure the altitude of cloud formations.

Major German electronics producers are reportedly pulling their military production out of West Berlin. The growing importance of German electronics to NATO defense efforts and fear of another Berlin blockade are possible explanations.

Engineering the housings for electronic systems and equipment

Would you ask your electrical design engineer to design your wife's dress?

Of course not. Neither should you expect electronic systems engineers to design sheet metal chassis, cabinets, housings, racks, and enclosures.

The reason: Sheet metal design is a *specialized* task, requiring the techniques and understanding which come only from experience in sheet metal engineering. The advantages inherent in making use of the services of experts in sheet metal design are *all important*. They involve the major considerations of functional reliability; appearance; and costs of tooling and production, which will be determined directly by design.

Call on the services of KARP, LESSER & CO., INC. to augment the work of your own staff, in the area of sheet metal engineering. As independent engineering consultants, we *specialize* in the mechanical aspects of designing for electronics, including chassis and housing design, estimate evaluation, and field engineering.

Write or telephone today. Ask for KARP, LESSER information sheets outlining our services in detail.

The Blueprint Man has turned engineer! His specialized design knowledge is now available to you.

KARP, LESSER & CO., INC.

60 East Forty Second Street, New York 17, N. Y., OXford 7-0510

PLANTS and PEOPLE

NEW TEAM LaForge, McKee and Goodman take over at Mountain View as . . .

SYLVANIA shuffles line, backfield

BIG, DIVERSE Sylvania Electric Products is expanding its plant acreage and shoring up its management structure all over the country. At the company's Mountain View, Calif., microwave tube laboratory, three executives move into new jobs and an 18,000-sq ft expansion of lab space is planned. In New York, an exec v-p of Perkin-Elmer moves in as president of a new Sylvania joint venture. The avionics lab in Waltham, Mass., and the parts division in Warren, Pa., have new executives.

The microwave lab's stepped-up program of research is in the hands of three new managers. Louis H. LaForge steps into the job of manager of engineering. Daniel H. Goodman, who has directed microwave research before this at Mountain View, becomes manager of research and advanced development. Project engineer Lefler McKee becomes manager of product design and development.

Lee L. Davenport, former officer of Perkin-Elmer moves over to Bayside, N. Y., to become president of Sylvania-Corning Nuclear Corp., jointly owned by Sylvania and Corning Glass. The corporation has optioned 150 acres in Andover, Mass., as the proposed location of a multimillion-dollar atomic center.

Merle W. Kremer, former special executive assistant in the parts division of Sylvania, is now general manager. The division also gets a couple of new sales executives as Richard E. Corcoran moves up to take over wire and weld products and Howard F. Messick takes over the Chicago district.

Former technical manager Charles E. Arnold moves up to become manager of the avionics laboratory in Waltham.

AIR ASSOCIATES reorganizes

LONGTIME aviation goods maker Air Associates is reorganizing its facilities and changing its name. New name: Electronic Communications Inc.

New plant: construction is already started on a 20,000-sq ft research laboratory in Baltimore. Donald D. King, former head of Johns Hopkins Radiation Lab, is director of the Baltimore facility.

ECI has leased 75 acres on the Tampa peninsula near St. Petersburg, Fla., for new plant construction. First stage will be 200,000 sq ft of production capacity, ultimately to expand to 800,000 sq ft. Engineering division in Orange N. J., and production facilities at Teterboro, N. J., will move to the St. Petersburg plant.

The name Air Associates will be retained by the company's supply division, which remains in Teterboro.

SPERRY forms tube division

NEW SPERRY GYRO president Carl Holschuh is forming an electron-tube division to handle research, development and production of klystrons and traveling-wave tubes. Manager of the new division is former director of tube engineering James E. Shepherd.

Aftermath of Holschuh's accession to the presidency is the appointment of former manufacturing v-p E. U. daParma as operations vice president for Sperry Gyro. He succeeds C. A. Frische, who recently stepped into Holschuh's old job as exec v-p. Holschuh also gives himself an assistant, appointing Paul T. Cullen, former sales representative in surface armament.

Another Sperry Rand division, Ford Instrument, has a new vice

Business MEETINGS

Mar. 25-29: AMA Seminars 9301 & 9003 on Law and Finance and International Marketing Operations. Sheraton-Astor, N. Y.

Apr. 9-10: Conference on Electronics in Industry on the campus of Illinois Institute of Technology, Chicago.

president and general manager as Charles S. Rockwell moves up from Sperry Farragut, Sperry Rands former missile manufacturing facility in Bristol, Tenn., to take over.

Meanwhile, across the bay from the city of Tampa, Fla., Sperry Rand will build a $2-million plant for research in microwave physics, radar and missile instrumentation. First step will be a 75,000-sq ft engineering laboratory. Manager of the new division is Eugene J. Venaglia, longtime Sperry engineer.

CHIEFS Strommen and Moe take to the air as their . . .

New firm scouts MIDWEST site

RECENTLY FORMED to manufacture a film resistance material for use in heating equipment, Verrall Moe Electronics is already looking in the Midwest for a fourth production plant.

The company has factories in Angola and Indianapolis, Ind., and Miami, Fla. Company headquarters are in Jefferson, Wis.

The resistance material Moe manufactures can be applied to surfaces of any contour. Verrall Moe, optimistically expanding production, hopes his material will eliminate resistance coils in equipment requiring controlled temperature.

BECKMAN grows— with some pains

BECKMAN INSTRUMENTS is building a $1.5-million research and development facility in Fullerton,

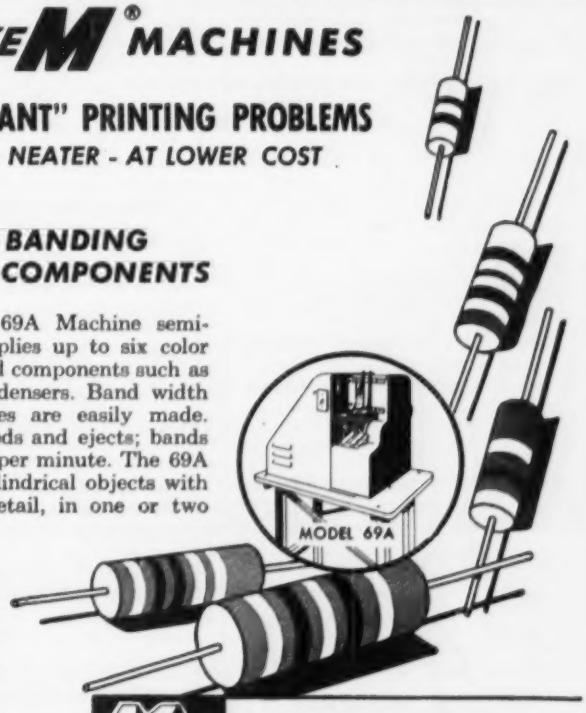
MARKEM® MACHINES

Solve "IN-PLANT" PRINTING PROBLEMS
- FASTER - NEATER - AT LOWER COST

COLOR BANDING
WIRE LEAD COMPONENTS

The Markem 69A Machine semi-automatically applies up to six color bands to wire lead components such as resistors and condensers. Band width and color changes are easily made. Automatically feeds and ejects; bands about 50 objects per minute. The 69A will also mark cylindrical objects with complete label detail, in one or two colors.

Other Markem machines available for marking electrical parts and products of all sizes and shapes. Write for detailed information.



MARKEM MACHINE CO.
KEENE 8, NEW HAMPSHIRE

EMPLOYMENT OPPORTUNITIES

NATIONAL COVERAGE

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant | Civil Service Opportunities | Employment Agencies
Positions Wanted | Selling Opportunities Wanted | Employment Services
Part Time Work | Selling Opportunities Offered | Labor Bureaus

DISPLAYED ——RATES—— **UNDISPLAYED**

The advertising rate is $25.25 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—20 inches to a page.

Subject to agency commission.

$2.40 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to agency commission.

Send NEW ADS or inquiries to Classified Adv. Div. of ELECTRONICS, P. O. Box 12, N. Y. 36, N. Y.

Research Scientists

At the AVCO *Research Laboratory* a young, creative scientist can find satisfaction in a small, youthful, progressive laboratory which is moving rapidly along in the modern, scientific world.

Integrated here in a university-type atmosphere are the fields of physics, aerodynamics, and physical chemistry. You derive individual satisfaction working in these broad areas of knowledge in intimate contact with a top-notch scientific group. You receive individual recognition for your contribution for a new understanding of scientific fundamentals through publication of research results in the standard journals.

The *Research Laboratory* is engaged in the study of gases and gas dynamics at high temperatures. We are interested in the phenomena accompanying the dissociation and ionization of gases and in the application of these phenomena. Future plans call for research in non-competitive fields for application to defense and commercial products.

There are many more satisfactions to be derived from a research career with the AVCO *Research Laboratory*, including excellent salaries, promotion on merit (individual achievement), and an exceptional benefits program with retirement provisions and an educational aid plan (pays full tuition).
Relocation expenses paid.

If you are interested in genuine research activity and have related research experience, you will be interested in these positions:

Jr. Scientists — Degree in Physics or Aerodynamics.

Associate Scientists — Degree in Aerodynamics.

Sr. Scientists — Degree in Physical Chemistry or Physics or Mathematics or Electronics.

Sr. Electronic Physicist — Advanced Degree in Physics or Electrical Engineering to lead a group which invents, designs, and develops electronic research techniques for the Laboratory.

Send resume to Mr. Robert M. Hale.

AVCO RESEARCH LABORATORY

A Unit of the Research and Advanced Development Division AVCO MANUFACTURING CORP.
2371 Revere Beach Parkway
EVERETT, MASSACHUSETTS

Calif. The new plant will house all of the research and development activities for the company's scientific instruments division, provide space for sales and other activities.

The firm's Berkeley Division is meanwhile trying to persuade the city of Richmond, Calif., that sections of three streets should be closed to make way for an expansion next to the existing Berkeley plant. The planned expansion would make room for twice the present plant force of 750 employees.

Executive MOVES

ADMIRAL is forming a subsidiary, Admiral Credit Corp., to handle financing of dealer purchases. **C. R. Oberholser** moves in as vice president and general manager of the credit outfit. Admiral hired him away from Northern Illinois Corp.

New director of marketing for Eitel-McCullough is **O. H. Brown,** formerly manager of commercial marketing for Eimac. **William H. McAulay** gets the appointment as his assistant.

Walter C. Byrne Jr. moves up to become sales manager of Motorola's microwave and industrial control products. . . . Packard-Bell general counsel **William H. Moore** moves up to become a vice president, keeping his old job.

Kenneth C. Meinken, president of Philadelphia's Electronic Tube Corp., creates the job of exec v-p, dropping **Kenneth C. Meinken Jr.** into the slot. Young Meinken had been v-p and sales manager of General Instrument. **Robert F. Brunner** moves up as vice president in charge of sales for Electronic Tube.

Allied Radio moves company oldtimers **Arthur E. Davis, Alfred W. Preskill** and **Alex Brodsky** into vice presidencies.

COMPUTER ENGINEERS and SCIENTISTS

You are invited to participate in an integrated attack on all types of computer problems

AT GENERAL ELECTRIC'S COMPUTER DEPARTMENT IN PHOENIX, ARIZONA

At General Electric's new Phoenix operation, engineers and scientists are working to solve the many "bottleneck" problems now limiting computer performance. New concepts in procedures, systems configurations and methods of data flow are being formulated. Radical improvements in costs, reliability and flexibility of operation are being made. Both analog and digital computer investigations are under way in the following areas: **Data Processing Systems • Information Storage and Retrieval Systems • Automation for Industry and Business • Scientific Computation • Systems Analysis and Synthesis.** Is this the sort of pioneering work—in a rapidly advancing field—that appeals to you? If so, take advantage of one of the openings that exist at both our Phoenix, Arizona and Menlo Park, California installations for men with experience in: **System Integration • Logical Design • Electronic Design • Peripheral Equipment Development • Product Packaging • Components and Instrumentation • Advanced Programming.**

Send your reply in strict confidence to: Mr. James Torrey
COMPUTER DEPARTMENT • GENERAL ELECTRIC CO.
Orange Street at Van Ness Avenue • Tempe, Arizona

GENERAL ELECTRIC
COMPUTERS

FOR RATES OR INFORMATION

About Classified Advertising

Contact The McGraw-Hill Office Nearest You

ATLANTA, 3
801 Rhodes-Haverty Bldg. *WAlnut 5778*
R. POWELL

BOSTON, 16
350 Park Square *HUbbard 2-7160*
H. J. SWEGER

CHICAGO, 11
520 No. Michigan Ave. *MOhawk 4-5800*
W. HIGGENS J. BRENNAN

CINCINNATI, 37
1825 Yorktown Rd. Swifton Village, Apt. 2 *REdwood 1-3258*
G. MILLER

CLEVELAND, 15
1510 Hanna Bldg. *SUperior 1-7000*
W. SULLIVAN

DALLAS, 2
Adolphus Tower Bldg. Main & Akard Sts. *Riverside 7-5064*
G. JONES

DETROIT, 26
856 Penobscot Bldg. *WOodward 2-1793*
W. STONE

LOS ANGELES, 17
1125 W. 6th St. *MAdison 6-9351*
C. W. DYSINGER D. McMILLAN

NEW YORK, 36
330 West 42 St. *LOngacre 4-3000*
S. HENRY R. LAWLESS D. COSTER

PHILADELPHIA, 3
17th & Sansom St. *Rittenhouse 6-0670*
H. BOZARTH

ST. LOUIS, 8
3615 Olive St. *JEfferson 5-4867*
W. HIGGENS

SAN FRANCISCO, 4
68 Post St. *DOuglas 2-4600*
R. C. ALCORN

SELLING OPPORTUNITY WANTED

Expanding aggressive agency calling on electronic manufacturers in New England desires additional electronic component or instrumentation line. RA-4434, Electronics, P. O. Box 12, New York 36, N. Y.

PROFITS and PRESTIGE
Midwest representation wanted for a reliable, progressive manufacturer of coaxial and waveguide testing equipment.
Illinois, Indiana, Michigan, Wisconsin, Ohio and Western Pennsylvania open.
Quality products. Reliable deliveries. Two plants.
New products in development.
Interesting arrangements for right rep.
Tell us about yourself, present lines, etc.
RW-4439, Electronics,
Class. Adv. Div., P.O. Box 12, N.Y. 36, N. Y.

PROFESSIONAL SERVICES

TRANSISTOR CONSULTANTS, INC.
TRANSISTOR ENGINEERING
Consultation; cost analysis; training programs.
Engineering systems and Design Studies.
Instrumentation; Prototype Construction.
New Processes and Component Designs for Transistorized Computers; Servos; Radios.
Laboratory Investigations; "Life-Test"; Fringe Area" Evaluations.
P. O. Box 333 Morris Plains, N. J.

YARDNEY LABORATORIES
Research-Design-Development
Electro-Chemical Generators of Energy
16-18 Leonard Street WOrth 6-3100
New York 13, N. Y.

Design and development ENGINEER

Graduate electrical, with knowledge of modern servomechanisms, instrument-minded. Should have studied electronics and have had at least five years practical design experience in servo mechanisms and related components. Established firm located in Southern New England, manufacturing electrical instrument specialties for 25 years. Pension plan and fringe benefits. Salary open. Submit resume and salary expected.

P-4257, Electronics,
Class. Adv. Div., P. O. Box 12, N. Y. 36, N. Y.

SENIOR ELECTRONIC *Physicist*

Graduate degree in electronics to lead a group which invents, designs and develops electronic research techniques for a young, progressive research laboratory in the greater Boston area. Salary open.

Send resume including salary requirements in confidence to

P-4241, Electronics
Class. Adv. Div., P. O. Box 12,
N. Y. 36, N. Y.

REPS handle captive lines

COMPANIES with their own sales and service organizations sometimes find that manufacturers' representatives give their products as efficient service as their own organizations do. Victor Adding Machine, for example, in launching its electronic Digit-Matic printer, appoints **Perlmuth Instrument Enterprises,** 35-year-old California rep, to handle the line.

R. S. Puleo, Valley Stream, L. I., is New York representative for West Coast radiotelephone manufacturer Kaar Engineering.

Dayton instrument maker WacLine Inc. has new reps in the East and South. **American Engineering Sales** handles WacLine products in Miami, Fla.; **Rocke International,** New York, covers the foreign market and **Arthur E. Carlson,** Havertown, Penna., serves the Philadelphia area.

Philadelphia rep **Samuel K. MacDonald** is now specializing in component parts and test equipment.

Walpole, Mass., rep firm **Smith & Purdy** now handles Marconi Instruments products in the New England area.

New rep firms: **Ben Z. Rubin,** serving industrial customers in the Detroit area with a line of instruments and controls. **Weatherbie Associates,** San Jose, Calif., serving California north of San Luis Obispo and northern Nevada.

Other DISTRIBUTION news

SERVO CORP. now reaches Minnesota and Wisconsin with its line of instruments through the **Dave Gilbertson** organization.

Armco thin electrical shields are being distributed by Indianapolis magnet maker **Thomas & Skinner Inc.**

Northeastern Engineering's test equipment is now merchandised in New England and upper New York State by **Instrument Dynamics** Wellesley Hills, Mass.

INDEX TO ADVERTISERS

Adams & Westlake Co. 2, 3
Airpax Products Co. 45

Cambridge Thermionic Corp. 24
Chicago Telephone Supply Corp. 7
Clevite Transistor Products 23
Clifton Precision Products Co., Inc. 9
Commonwealth of Puerto Rico 38

DuMont Laboratories Inc., Allen B. 4

General Radio Co. ..... 3rd Cover

Hollenbeck and Co. 34

Jonas Co., Dr. F. 33

Karp, Lesser & Co., Inc. 43
Kearfott Co., Inc. 35

Markem Machine Co. 45
Maxson Instruments Div. of the W. L. Maxson Corp. 10
McGraw-Hill Book Co. 25, 28

Peter Partition Corp. 34

Radio Corporation of America ..29, 4th Cover
Raytheon Manufacturing Co. ..... 2nd Cover

Servo Corp. of America 31
Sodaro Co. 33
Sound Apparatus Co. 36
Sperry Gyroscope Co. 12
Standard Record Mfg. Co. 38
Stewart Warner Electronics, a Div. of Stewart Warner Corp. 41

Telerad Mfg. Corp. 39
Texas Instruments Incorporated 18
Tung-Sol Electric Inc. 8

United Air Lines 24D
Universal Winding Co. 27

Virginia Dept of Conservation and Development 11

•

PROFESSIONAL SERVICES 47

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES ...46, 47

About our TECHNICAL edition . . .

(All ELECTRONICS subscribers receive two Business Editions *and* the Technical Edition each month.)

Adult salmon on spawning run are tagged with ultrasonic transistor transmitter so that movements can be tracked by sonar receiver on boat and shown as ppi display. Details are supplied by Trefethen of U. S. Fish and Wildlife Service and Dudley and Smith of Minneapolis-Honeywell in the April 1 edition of ELECTRONICS.

Tv broadcasters can detect intercarrier failure with monitor described by K. Atwood of the University of Utah in our March 1 edition. Failure of either or both carriers sounds alarm and starts recorder that shows time and duration of program break.

Roll-and-pitch data systems reported by Warren and Corden of Ryan Aeronautical in our March 1 edition control a drone target used for missile testing at near-sonic speeds. Controls permit operator to steer plane over preselected course.

Methods of boosting transistor switching speed are discussed by R. Baker of MIT in our March 1 edition. Transistor properties affecting response time in switching circuits are summarized and basic circuits given for obtaining maximum energy-conversion efficiency.

Basic logic circuits for computers are described in our March 1 edition by Booth and Bothwell of RCA. Included are flip-flop, gated pulse amplifier, d-c amplifier, power amplifier and indicator. All use high-frequency junction transistors.

Using radiotelephone instead of radiotelegraph for long-distance communication with commercial aircraft requires more effective power and reduction of noise. How it was done at Pan American is described in our April 1 edition by B. Rashkow of National Aeronautical. **THE EDITORS**

electronics READER SERVICE CARD

FOR ADDITIONAL INFORMATION ON ADVERTISEMENTS AND NEW PRODUCTS

Here is How to Use the Card!

WANT MORE INFORMATION ON ADVERTISEMENTS?

For more information on an advertisement, circle page number of advertisement in section A on the reader service card (below).

If there is more than one advertisement on the page, the position of the ad will be indicated by letters following the page number. The letters following the page number will indicate the ad's positions: R-Right, RT-Right Top, RB-Right Bottom, L-Left, LT-Left Top, LB-Left Bottom, M-Middle, MT-Middle Top, MB-Middle Bottom (i.e. 230L). Diagrams on back of this page show how to use the key.

On pages with no number such as bleed pages, count from the last numbered page to find the number. Inserts are numbered using last numbered page plus A, B, etc. If you are not sure of a page number, consult the advertisers index.

WANT MORE INFORMATION ON NEW PRODUCTS?

Each New Product item in ELECTRONICS has a number (P1, P2, etc.) Circle the corresponding number in section B of the Reader Service Card (below).

YOUR ACCURACY ASSURES CORRECT REPLIES

There are two cards for your convenience. Use one, or both if necessary. Print carefully, then tear off and mail. We are unable to process cards where name and address is illegible.

See Fractional Page Diagram on Other Side of This Page!

FILL IN NAME, POSITION, COMPANY & ADDRESS HERE

MAR 10·57
CARD EXPIRES JUNE 10TH

• electronics • READER SERVICE CARD

Please Print Carefully

NAME POSITION

COMPANY

ADDRESS

FOR ADDITIONAL INFORMATION ON AN AD, CIRCLE CORRECT NUMBER IN SECTION A

SECTION A

2	8	11	23	25	29	33B	35	38B	43	2nd Cover
3	9	12	24	27	31	34T	36T	39	45T	3rd Cover
4	10	18	24D	28	33T	34M	38T	41	45B	4th Cover

NEW PRODUCT INFORMATION? USE SECTION B

SECTION B CIRCLE FOR NEW PRODUCTS HERE!

P1	P6	P11	P16	P21	P26	P31	P36	P41	P46	P51	P56	P61	P66	P71	P76	P81	P86	P91	P96
P2	P7	P12	P17	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P98
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

TEAR HERE

FILL IN NAME, POSITION, COMPANY & ADDRESS HERE

MAR 10·57
CARD EXPIRES JUNE 10TH

• electronics • READER SERVICE CARD

Please Print Carefully

NAME POSITION

COMPANY

ADDRESS

FOR ADDITIONAL INFORMATION ON AN AD, CIRCLE CORRECT NUMBER IN SECTION A

SECTION A

2	8	11	23	25	29	33B	35	38B	43	2nd Cover
3	9	12	24	27	31	34T	36T	39	45T	3rd Cover
4	10	18	24D	28	33T	34M	38T	41	45B	4th Cover

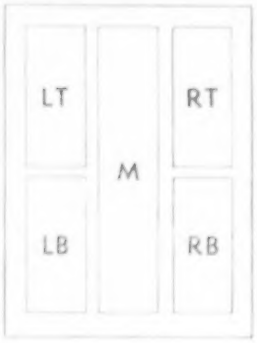
NEW PRODUCT INFORMATION? USE SECTION B

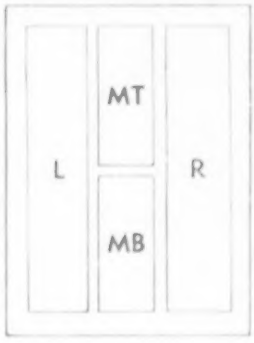
SECTION B CIRCLE FOR NEW PRODUCTS HERE!

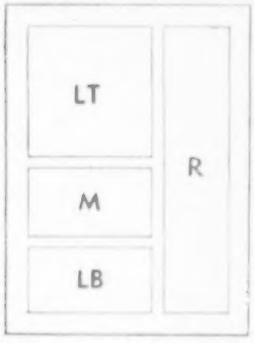
P1	P6	P11	P16	P21	P26	P31	P36	P41	P46	P51	P56	P61	P66	P71	P76	P81	P86	P91	P96
P2	P7	P12	P17	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P99
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P98
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

DIAGRAMS BELOW SHOW HOW TO USE THE KEY

ON PAGES WITH MORE THAN ONE ADVERTISEMENT







FIRST CLASS
PERMIT NO. 64
(Sec. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By

ELECTRONICS
Reader Service Dept.
330 West 42nd Street
New York 36, N. Y.

FIRST CLASS
PERMIT NO. 64
(Sec. 34.9 P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4¢ Postage Will Be Paid By

ELECTRONICS
Reader Service Dept.
330 West 42nd Street
New York 36, N. Y

On pages with more than one advertisement, the page number PLUS the correct letters (as shown above) are necessary to indicate the POSITION of the advertisement.

You must circle the page number with the correct letters after it (i.e. 240 L, which means page 240 Left).

USE THIS KEY:

R—Right

RT—Right Top

RB—Right Bottom

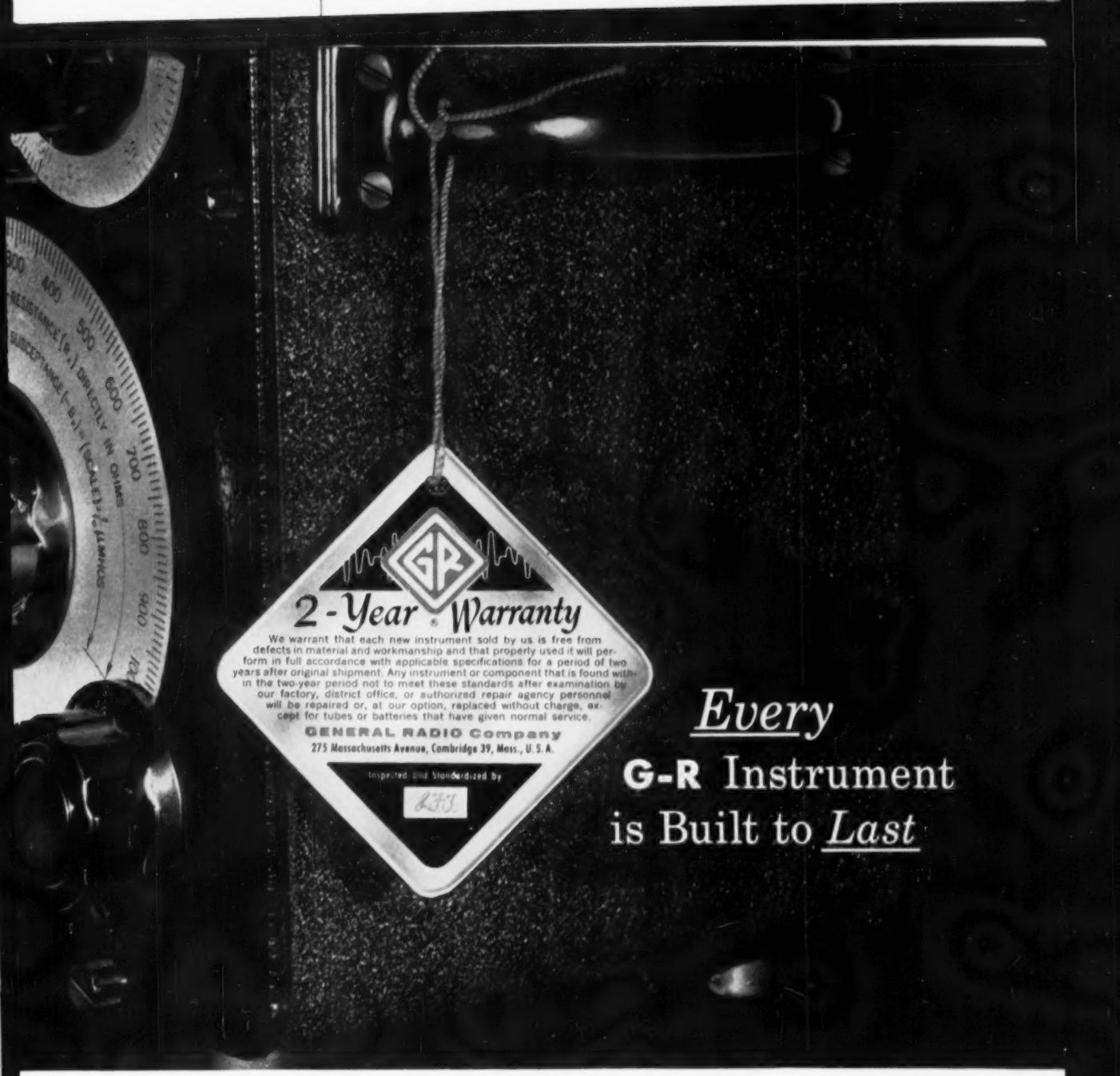
L—Left

LT—Left Top

LB—Left Bottom

M—Middle

MT—Middle Top


2-Year Warranty
We warrant that each new instrument sold by us is free from defects in material and workmanship and that properly used it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, district office, or authorized repair agency personnel will be repaired or, at our option, replaced without charge, except for tubes or batteries that have given normal service.
GENERAL RADIO Company
275 Massachusetts Avenue, Cambridge 39, Mass., U.S.A.
Inspected and Standardized by
Every
G-R Instrument
is Built to Last

It is the essence of G-R's design and manufacturing philosophy that every General Radio instrument shall be built to operate as reliably years later as it did upon first purchase by the customer.

This policy has built the reputation for quality and long life which has come to be synonymous with the G-R trademark and now makes possible a *two-year warranty* to purchasers of G-R products. This warranty applies to all newly purchased General Radio products shipped after March 1, 1957.

General Radio Company

Since 1915, Manufacturers of Precision Electronic Equipment for Science and Industry

275 Massachusetts Avenue, Cambridge, Massachusetts

NEW YORK PHILADELPHIA WASHINGTON, D. C. CHICAGO LOS ANGELES SAN FRANCISCO

RCA offers a broad line of superior-quality p-n-p transistors for RF, IF, AF, and Switching service in entertainment, industrial, military, and computer applications.

When you design equipment for mass production, *uniformity of transistor characteristics* is vital to good end-product. Special-purpose electronics apparatus requires transistors with the added feature of *extreme stability*. RCA's advanced manufacturing techniques combined with rigid quality controls assure "top performance" in commercial, military, and industrial applications. Described here are some of the outstanding transistors from RCA's broad line—*now commercially available*.

RCA-2N247—"Drift" Transistor for use as an RF amplifier in the AM broadcast-band and up into the short-wave bands. Flexible leads.

RCA-2N109—For large-signal AF amplifier service. In class A, one RCA-2N109 can deliver a max.-signal power output of approximately 75 milliwatts; in class B push-pull, a pair can deliver up to 150 milliwatts. Linotetrar 3-pin base.

RCA-2N217—Flexible lead version of RCA-2N109.

RCA-2N139—For 455-Kc IF amplifier applications in standard-AM broadcast-band receivers. Linotetrar 3-pin base.

RCA-2N218—Flexible lead version of RCA-2N139.

RCA-2N140—For converter and mixer-oscillator applications in standard-AM broadcast-band receivers. Linotetrar 3-pin base.

RCA-2N219—Flexible lead version of RCA-2N140.

RCA-2N269—For low-level, medium speed, on-off, control applications such as in flip-flop and gating circuits. Flexible leads.

RCA-2N270—For large-signal AF amplifier service. In class A, one RCA-2N270 can deliver a max.-signal power output of approximately 60 milliwatts; in class B push-pull, a pair can deliver up to 500 milliwatts. Flexible leads.

RCA-2N175—Extremely low-noise type for pre-amplifier or input stages of transistorized audio amplifiers operating from extremely small input signals. Linotetrar 3-pin base.

RCA-2N220—Flexible lead version of RCA-2N175

RCA-2N206—For moderate-power AF amplifier service in military and commercial equipment. Meets military specification MIL-T-25380/4 USAF. (Max. collector dissipation, 75 milliwatts.) Flexible leads.

RCA-2N301—For audio-power output stages of auto radio, and marine, military and other equipment requiring high output with low distortion at high power gain. In class A, one RCA-2N301 can deliver a max.-signal power output of approximately 2.7 watts; a pair can deliver up to 12 watts in class B push-pull.

RCA-2N301-A—Similar to RCA-2N301, but designed especially for equipment requiring operation at peak collector voltages as high as 60 volts.

* * *

Contact your RCA Field Representative for a discussion of the many advantages offered your specific designs by RCA Transistors.

EAST . . . . . Newark 2, N.J.
744 Broad Street
HUmboldt 5-3900

WEST . . . . . Los Angeles, Calif.
6355 E. Washington Blvd.
RAymond 3-8361

MIDWEST . . . . . Chicago, Ill., Suite 1181,
Merchandise Mart Plaza
WHitehall 4-2900

GOVERNMENT . . . Dayton, Ohio
224 N. Wilkinson Street
HEmlock 5585

Washington, D.C.
1625 "K" Street, N.W.
District 7-1260

For technical data on RCA Transistors, write to RCA Commercial Engineering, Sec. C19NN2, Somerville, N. J.

RCA®

SEMICONDUCTOR DIVISION

RADIO CORPORATION OF AMERICA

Somerville, N. J.